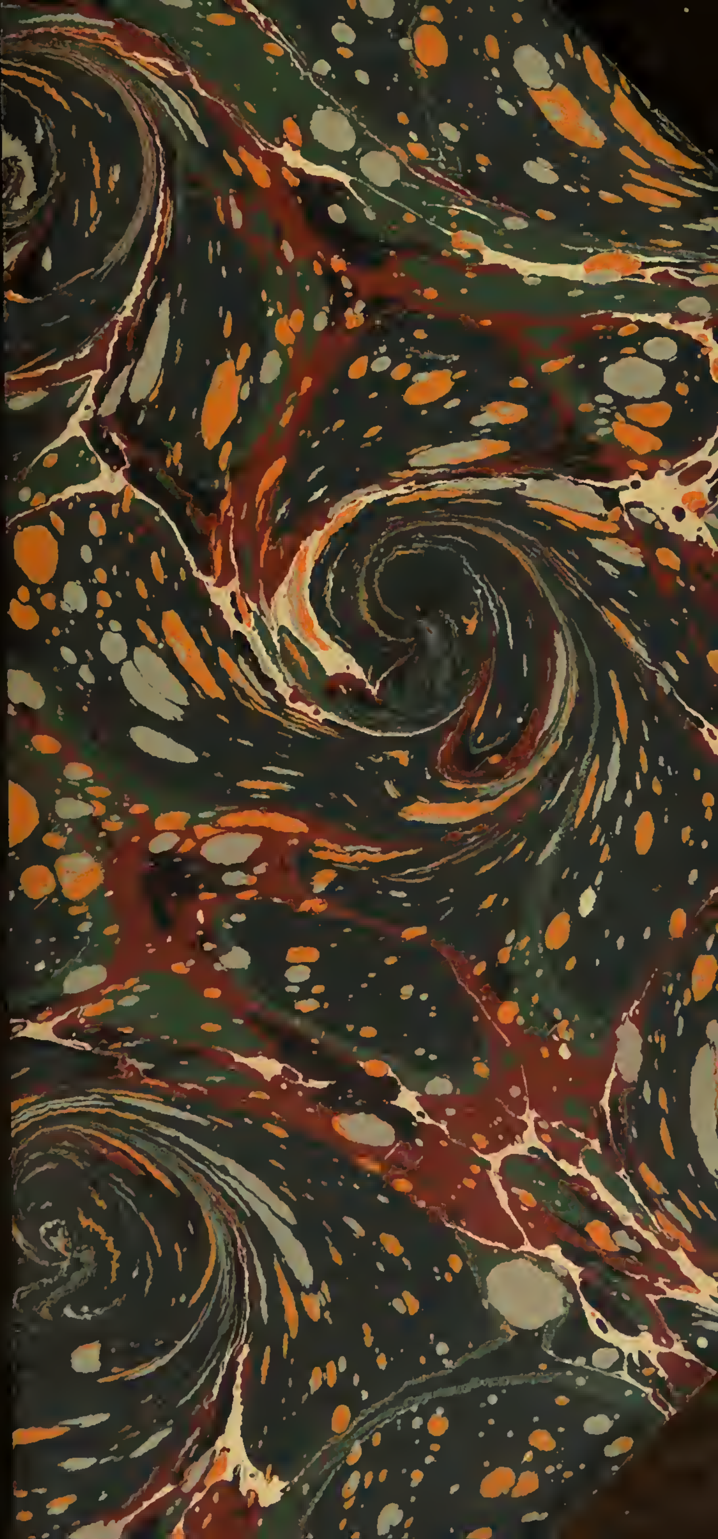

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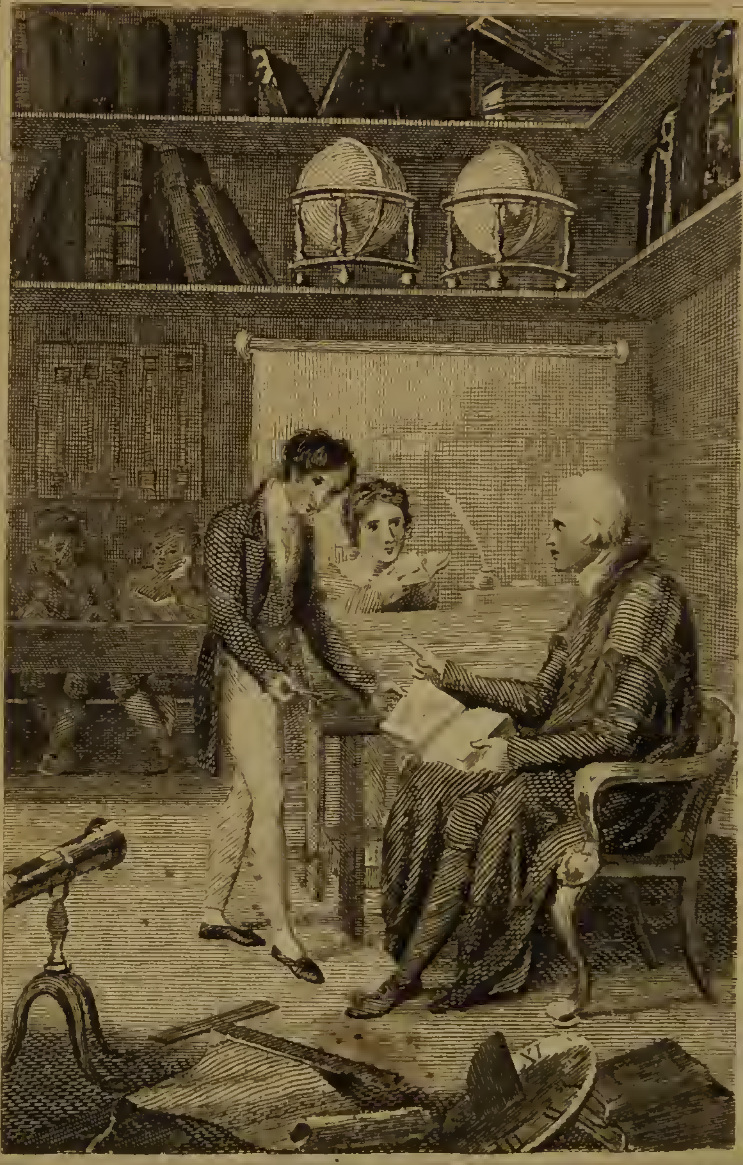

'Tis to the Preſs and Pen we Mortals owe
All we believe and almost all we know
All hail the great Preservers of those Arts
That raise our thoughts and Cultivate our parts.

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OR,

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CONTAINING

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By *GEORGE FISHER*, Accomptant.

The Twenty-Ninth Edition, Corrected and Improved throughout.

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THE

PREFACE.

I NEED say but little by way of Preface, in relation to the Usefulness of this Book, the Title Page so fully declaring its Contents: But as a Preface is usually expected, I cannot well avoid saying something with Respect to its Utility.

As to the first Step of forming the Young Man's Mind for Business, viz. *the being instructed in, and acquainted with our Mother Tongue,* viz. English, *it must be, and is acknowledged by all, to be a necessary and principal Qualification in Business, and therefore it is of great Importance to be well acquainted therewith.*

In the next Place, to write a good, fair, free, and commendable Hand, is equally necessary in most, if not in all the Affairs of Life, and Occurrences of Business.

The Young Man is, next, informed how to indite Epistles or Letters in a familiar Stile, and on sundry Subjects and Occasions: With Directions how to subscribe or conclude a Letter, and also to superscribe or direct Letters, according to the different Ranks and Qualities of the Persons to whom directed: And this must be allowed to be a very great additional Qualification.

The next Accomplishment for a young Man, and largely treated on in this Book, is that excellent Science of Arithmetic, *both Vulgar and Decimal: Leading* *him by the Hand, and by easy Steps, through its whole Course.*

Again, the young Man is next shewn the ingenious Art of Book-keeping after the Italian Manner, by Way of Double Entry; and that is an Accomplishment that capacitates him for Business in the highest Degree: Under which Head, he is also informed how to draw out, or make various Sorts of Accompts or Writings relating to Mercantile Affairs; as Bills of Lading, Invoices, Accompts of Sales, together with Authentic Examples of Bills of Exchange, with Notes concerning them; likewise Bills of Parcels of divers Kind; also various Sorts of Receipts, &c. *All which is expedient for a young Man to know and understand, if he would be dextrous in Business.*

The young Man is here also instructed in Relation to the Affairs of Business at the Water-side, as to Shipping off and Landing Goods, &c.

He hath also a Description of England *and* Wales, *each County being particularly spoken of, with respect to its Product, Soil, and Extent, and likewise the Names of its several Market-Towns.*

Here are also easy, plain, and likewise curious Directions for Measuring all sorts of Planes and Solids (Arithmetically and Instrumentally) as the Works of Carpenters, Joiners, Sawyers, Bricklayers, Masons, Plaisterers, Painters, Glaziers, &c. *with the Prices of their Works.*

Here is likewise shewn the Methods of extracting the Square and Cube Roots, with some of their Uses in relation to Measuring, &c.

Also Practical Gauging of divers Kinds of Vessels, Tuns, &c. *Likewise Dialling in various Kinds, with the Representation of several Sorts of Dials, and how to beautify and adorn them.*

Next are Precedents of Law-Writings, as Bonds, Bills, Indentures, Wills, Letters of Attorney, &c.

Lastly, some Directions relating to the pleasant and delightful Art of Gardening, with general Observations for every Month in the Year.

In the Course of the Work is given a compendious System of Geography and Astronomy: The first is of great Utility to the trading Part of Mankind, and to those who would have an adequate Idea of what they read, in History or otherwise, of the Transactions in different Parts of the Earth: and the second is of like Service to those who would contemplate the heavenly Bodies, and is purposely designed, to give the unexperienced Reader some small Idea of the almost inconceivable Number of Bodies, (most of them, much superior in Magnitude to our World, as we vainly term it) which the Almighty and Infinite Creator hath placed in the Universe, and exhibited to the View and Conception of Mankind.

Also a Table of Stamps, being the last, as enacted, 1805, *on Notes payable on Demand; Bills, or Notes, payable after Date, or Sight, Notes payable on Demand and re-issuable after Payment; Foreign Bills of Exchange: Receipts; Bonds and Sundries; with concise Tables to buy or sell by the Great Hundred; and to shew the Interest of any Sum at* 3, 4, *and* 5 per Cent.

ADVERTISEMENT

TO THE

TWENTY-NINTH EDITION.

THE Editor of this new Edition has carefully revised the whole Work, making, in almost every Part of it, considerable Improvements and Additions; and he trusts it will be found, in its present State, highly deserving of the Public Patronage. A better or a more useful Book can scarcely be put into the Hands of young Persons launching into Life. It contains the fundamental Principles of almost all the Sciences, explained in so familiar a Manner, as to render the Acquirement of Knowledge an Amusement rather than a Task.

The Patrons of Sunday and other Schools devoted to the Instruction of young Persons in the inferior Ranks of Society, would very much encrease the Utility of their Institutions, if to each Pupil, upon leaving the School, were presented, with a Bible and other Religious Books, a Work so judicious and instructive as the "YOUNG MAN'S BEST COMPANION."

By Means of it, the Youth, already instructed in reading his Mother Tongue, might, and, if of an inquisitive Disposition, infallibly would advance Step by Step to the Attainment of every Species of Knowledge that is necessary to render him a respectable Member of Society.

Dec. 22, 1805.

TABLE OF CONTENTS.

Page
ENGLISH GRAMMAR 1
The Use of Letters; Vowels; Consonants; Diphthongs; their Number: how Pronounced and Written ..... ib.
Letters great and small, and when to be used 2
The Sound of Letters 3
Syllables, and the Art of Spelling 8
Stops, and other Marks used in Reading and Writing 20
Abbreviations 22
Directions to Beginners in Writing 24
Copies for Writing 28
Inks, Receipts for making 29
Familiar Letters on various Subjects 30
Secret Writing 35

ARITHMETIC 36
Notation and Numeration 37
Numerical Letters 39
Addition 40
——— of Money 42
——— of Avoirdupoise Weight 44
——— of Troy Weight 45
Various Tables 46
Subtraction 49
——— of Money, &c 51
Multiplication 54

Multi-

ARITHMETIC *(Continued)*

Page

Multiplication Table........................ 55
———— Compound........................ 56
———— of Money........................ 60
Division........................ 68
—— of Money........................ 79
Reduction Descending........................ 82
——— Ascending........................ 86
Foreign Coins, how to be reduced to Sterling Money........................ 90
Rule of Three Direct........................ 93
———— Inverse........................ 98
Double Rule of Three........................ 100
Practice........................ 103
Tare and Trett........................ 110
Vulgar Fractions........................ 113
———— Reduction of........................ 115
———— Addition of........................ 116
———— Subtraction of........................ 120
———— Multiplication of........................ 121
———— Division of........................ 122
Decimal Fractions........................ ib.
———— Reduction of........................ ib.
———— Valuation of........................ 124
———— Addition of........................ 125
———— Subtraction of........................ 126
———— Multiplication of........................ ib.
———— Division of........................ 127

BOOK-KEEPING........................ 128
Waste Book described........................ 129
Journal........................ ib.
Ledger........................ 130
Example of........................ 131

BOOK-KEEPING (*Continued*) Page
Receipts of different Forms........................ 140
Promissory Notes........................ 143
Bills of Parcels........................ 144
Bills of Exchange........................ 150
—— Indorsing of........................ 153
—— Protesting of........................ ib.
Bill of Lading, Form of........................ 154

BUSINESS AT THE WATER-SIDE, concerning exporting and importing Goods, &c........................ 157
Wharfage and Lighterage........................ 160
West India Docks........................ ib.

MENSURATION........................ 161
—— Of Planes and Solids........................ ib.
—— Superficial Measure........................ ib.
—— Joiners, Painters, Glaziers, &c. Proper Directions for........................ 166
Painter's Prices........................ 169
Joiner's Prices........................ 170
Sawyer's Work........................ 173
Bricklayer's Work........................ ib.
—— Prices........................ 176
Slater's Work........................ 177
—— Prices........................ ib.
Plaisterer's Work........................ ib.
—— Prices........................ 179
Mason's Work........................ ib.
—— Prices........................ ib.
Land Measure........................ 180
—— To reduce Statute to Customary Measure........................ 182
Solid Measure........................ 184

MENSURATION *(Continued)*

Page
Solid Measure of Timber.......... 185
—————— of a Globe, &c.......... 190
—————— divers Examples.......... ib.
Regular Figures.......... 193
—— Circles.......... 194
How to measure a Cube.......... 197
—————— a Cone.......... 198
—————— a Pyramid.......... 199

GAUGING.......... 201
—— Rules for.......... ib.
—— Examples in.......... 202

EXTRACTION OF ROOTS.......... 207
Examples of the Square Root.......... ib.
Examples of the Cube Root.......... 212
Application of the Square and Cube Roots.......... 215

GEOMETRICAL PROBLEMS.......... 220
Line of Chords, how to make.......... 222

INSTRUMENTAL ARITHMETIC.......... 223
Carpenter's Plain Rule.......... 224
Gunter's Line.......... 225
Coggeshall's Sliding Rule.......... 228

GEOGRAPHY.......... 230
Mariner's Compass.......... 235
Table of Climates.......... 236

EUROPE.......... 239
Spain and Portugal.......... ib.
France.......... 240
Germany.......... 244
Austrian Dominions.......... 245

EUROPE (*Continued*)

Page

Switzerland 246

Denmark and Norway .... ib.

Sweden .... ib.

United Kingdom of Great Britain, &c 247

ASIA 255

AFRICA 259

AMERICA 260

ASTRONOMY 262

Copernican System 263

Solar System, Laws of 272

Fixed Stars 274

Constellations 276

DIALLING 278

Quadrant, Description of 279

Dial, Horizontal 281

—— Erect South 283

—— Erect North 285

—— Erect East 286

—— Erect West 287

COLOURS and DYING 289

MONEY 291

Imaginary .... ib.

Gold and Silver, Value of 292

Table of Stamps 293

Table for buying and selling 294

Tables of Interest 295

Tables of sundry Things 298

Bonds, Bills, Indentures, &c. 299

Page
Letter of Attorney.. 303
Will, Form of... 304
—— Codicil to... 306

THE COMPLETE GARDENER..................................... 309

INSTRUCTIONS

INSTRUCTIONS
FOR
YOUTH,
TO SPELL, READ, AND WRITE
TRUE ENGLISH.

The Use of Letters; which are Vowels and which Consonants; what Diphthongs are, their Number, and how pronounced and written.

THE Design of this Book being to instruct Mankind, especially those who are young, in the Methods of conversing and transacting Business in the World; therefore those Accomplishments of spelling and writing good and proper *English*, claim the first Notice; for let a Person write ever so good a Hand, yet if he be defective in spelling, he will be ridiculed, and held in contempt, because his writing fair will render his Orthographical Faults more conspicuous. Therefore,

First, Syllables are made of Letters, Words of Syllables, and Sentences of Words, &c.

There are 26 letters; *viz. a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y,* and z. In these Letters, we are to observe their Names, their Form, and their Force: Their Names, by which to know them; their Form, whether great or small, and their Force in Pronunciation or Utterance.

Letters are distinguished according to their sound into Vowels and Consonants: A *vowel* is a Letter that soundeth by itself, and these are six in Number, *viz. a, e, i, o, u,* and *y* is also an *English* Vowel, when it cometh after a consonant, and hath the sound of *i*; as in *by, sly, reply, Syllable,* &c. but the *y* is never used in Words not derived from a foreign Language, otherwise than at their End. A consonant is a letter that hath no sound except it be joined with a Vowel, for without one of the Vowels no syllable can be made; as *b, c, d,* &c. without the Aid of a vowel, cannot be sounded. Though we have 26 Letters, and six of them *Vowels,* yet we have 21 *Consonants*: for *y,* when set before any *Vowel* in the same Syllable, becomes a Consonant; as in *youth, yonder, beyond,* &c. *Note,* that *j* hath the Sound of *g,* as in *join, jingle,* &c. *W* is a vowel at the end of a word. as *law, now.*

When two vowels come together in a syllable, and are not parted in the pronunciation, but united in one Sound, they are called *Diphthongs*; of these there are 13; *viz, ai, ei, oi, ui, au, eu, ou, ee, oo, ea, eo, oa,* and *ie*; as in *maid, faith, either, join, aul, eunuch, stout, feed, seed, food, broad, stealth, wealth, people, steeple, boat, goat, heat, beat, feat, friend, field,* &c. *Note,* In the first seven Words both *Vowels* are sounded; but in the other 15, one of them is scarcely heard.

There are also those that are called *Triphthongs,* where three *Vowels* meet in one sound; as in *beauty, beau, lieu,* and *quaint*: Likewise *ay, ey, uy, aw, ew,* and *ow,* become *Diphthongs* at the end of Words, but are called *improper Diphthongs*; as in *say, key, joy, saw, bow,* &c. *Note, aw, ew,* and *ow,* are commonly sounded as *au, eu,* and *ou.*

OF LETTERS GREAT AND SMALL, AND WHEN TO BE USED.

Great Letters are not to be used in the Middle or latter End of a word, except the whole Word be so written, as in JEHOVAH, LORD, or in Titles of books, &c. For it would be very absurd to write thus: To Mr. geoRge RoGeRs, in thaMES street; instead of, To Mr. George Rogers, in Thames-street.

Great Letters are to be written at the Beginning of Sentences: as, *Know when to speak, and when to be silent.*

At the beginning of all proper names of Places, Ships, Rivers, &c. as *London,* the *Dreadnought, Thames, Severn*: Also the Christian Names and Surnames, both of Men and Women, must begin with great Letters; as *Samuel Sharp.*

At the beginning of the more eminent Words in a Sentence:

tence: As *Faith is the Foundation of the Christian Religion*; or, if any Word that we have a particular Regard or Deference for; as *God, Christ, King, Queen,* &c. At the Beginning of every Line in Poetry; and, at the Beginning of the Names of Arts, Sciences, and Trades; as *Writing, Arithmetic, Geometry, Music, Carpenter, Smith,* &c.

Note, the personal Pronoun I, and the Interjection O, must be always written in Capitals; for it is ridiculous to write thus: *On Monday last i came to your House but you was not at home; o how much it grieved me!*

The small Letter *s* is commonly written *ſ* at the Beginning and in the Middle of a Word, and *s* at the end; but if two of them come together in the Middle of a Word, they may be written thus, *ſs*.

OBSERVATIONS CONCERNING THE SOUND OF LETTERS, AND WHICH ARE OMITTED IN PRONUNCIATION.

A is not sounded in *Pharoah,* nor in *Sabaoth,* but as if written *Pharo* or *Saboth*; neither in *Marriage,* but as *Marrige*; also *Parliament* as *Parliment,* and *Chaplain* as *Chaplin,* &c. In some proper Names it is dropped in the Pronunciation; as in *Aaron, Isaac, Canaan, Balaam*; which are pronounced as if written *Aron, Isac, Canan, Balam*; but we must except *Ba-al* and *Ga-al.* *A* is sounded broad, like *aw,* in words before *ld* and *ll*; as in *bald, scald, hall, wall, fall.*

B is not sounded in *thumb, dumb, plumb, lamb, doubt, debt, subtle,* &c. but sounded as if written, *thum, dum, plum, lam, dout, det, suttle,* &c.

C is sounded hard like *K,* before *a, o* and *u,* and before *l* and *r*; as in these Words, *cane, came, comb, cub, clay, crane, crab*; and soft in *cement, city,* and *tendency*: *C* loseth its sound in *scene, science,* and *victuals*; likewise in *indict, indictment*; also before *k,* as in *stack, rack, stick, thick, brick.* In Words of *Greek* and *Hebrew* Derivation, *C* is sounded like *K,* as in *sceptic, Cis, Aceldema,* &c.

Ch is sounded like *K* in many foreign Words, some of which occur in the Holy Scripture; as in *Chorus, Chymist, Chrysostom, Christ.* In the Word *Schism,* the Sound of *Ch* is lost, it being sounded as if it were *sism*; and in the Words *Rachel, Cherubim,* and *Archbishop,* it is sounded in the *English* manner. *Ch* in *French* Words sounds like *sh,* as in

Chevalier, pronounced *Shevalier*; *Machine, Masheen*; *Mareschal, Marshal*; *Capuchin, Capusheen*; *Chaise, Shaize*, &c.

D is not sounded in *Ribband*, nor in *Wednesday*, which are pronounced *Ribbon* and *Wensday*; the Termination *ed* is often shortened into *t*; as *burned, burnt*; *choaked, choakt*; *ripped, ript*; *passed, past*; *chopped, chopt*, &c.

E is not sounded in *hearth*, &c. *E final* is that placed at the end of a Word; and is seldom heard but in Monosyllables, as in *me, he, she, ye, thee*, &c. where it hath the Sound of *ee*: And in Words derived from foreign Languages, in which *e* hath its perfect Sound; as *Jesse, Jubilee, Mamre, Nineve, Candace, Cloe, Unice, Penelope, Salmone, Phebe, Epitome, Catastrophe, Gethsemane, Simile, Præmunire*, &c. In all other Cases *E final* serves only to lengthen the Sound, and to distinguish it from other Words of different Meaning, which are wrote without *e*, and are sounded short; as in these Examples following, *viz. cane, can*; *hate, hat*; *bite, bit*; *fare, far*; *hope, hop*; *made, mad*; *scrape, scrap*; *stare, star*; *tune, tun*: *write, writ*, &c. In Words of more than one Syllable, it lengthens the Sound of the last Syllables, but doth not increase the Number of Syllables; as *admire, demise, blaspheme*, &c. *E* lengthens the Syllable also in some foreign Words, such as *Eve, Tyre, Crete, Ode, Scheme*. *E* is seldom written after two Consonants; as in *pass, turn, black*. Yet after *rs* it is used, as *horse, nurse, purse*. Also the Words ending in *cre, gre*, and *tre*, sound the *e* before the *r*, as in these Words; *acre, lucre, centre, sepulchre, mitre, lustre*; which are sounded as if written *aker, luker, center, sepulcher, miter*, and *luster*. *E final* also serves to soften *c* and *g*, as in *ace, place, lace, spice, truce, oblige, huge, age*, &c. If Nouns in *e final* take *s* after them, with an Apostrophe before it, it stands for *his*, as the *Pope's Eye*, or the *Eye of the Pope*, the *Table's Foot*, or the *Foot of the Table*. If without an Apostrophe, it makes the Plural Number, as *Popes, Tables*. Words derived from those wrote with *E final*, seldom retain it, as in *writing, loving, doing*, &c. not *writeing, loveing, or doeing*; except in the termination *ge* and *ce*, before *able*, as in *changeable, peaceable*, &c. *E* should not be written after a Diphthong in these Words; *rain, main, gain, fear, know*, &c. not *raine, maine, gaine*, &c. *E final* is annexed, but not sounded, in those words which would otherwise end with *i, o*, or *u*; as in *die, foe, sloe, true, virtue*, &c. but there are some Exceptions, as *do, so, to*, &c.

Lastly, there are some Words in which the *final E* doth not lengthen the Sound, as *give, live, some, one, done*, &c.

F in Plurals is changed into *v*; as *wife, wives*; *staff, staves*; *knife, knives*.

G is not sounded in *sign, reign, gnaw, gnat, assign, design, seignior, seraglio, phlegm*, &c. *G* is sounded soft in *gender, ginger*, and *gipsey*; but hard in *Gibeon, Giberah, Gilboa, Geth-se-mane*; and hard also in these proper Names, *Gibson, Gilman*, and *Gilbert*; and likewise in these common Words, *gelt, geld, girt, gimp, geese, gander, gamble, gather, gild*, &c. Observe, that if *G* be hard with a long Vowel, *ue* is joined and pronounced in the same Syllable; as in *Plague, Prague, Hague, Rogue, League, Dialogue, Catalogue*, &c.

Gh in the End of some Words, where *au* or *ou* goes before, hath the Sound of *ff*, as in *tough, rough, cough, laugh*, sounded as if *tuff, ruff, coff, laff*; but *buff, cuff, snuff*, and *huff*, must be so written.——*Gh* is not sounded in *mighty, though, through, Daughter*, and *Vaughan*.

H hath Place, but no sound, in *Chronicle, Christ, Ghost, John, Rhine, Schedule*, and *Schism*, &c. *H* is not sounded at the End of Words if it be alone, but with *tc* before it, it is sounded as *snatch, watch*, &c.

I is not sounded in *adieu, juice, venison, fruit, bruise, Salisbury*; it is sounded like *ee* in *oblige, Magazine*, and *Machine*, &c. *I* is sounded long in proper Names ending in *iah*, as *Jeremiah*; *Hezekiah*; but short in *A-ri-el*, and *Mi-ri am* —*I* is sounded like *u* in *first, dirt, bird*, &c.

K is nearly allied in Sound to *C*; but to know when to use one, and when the other, *Note*, that *C* hath the Force of *K* only before *a, o, oo*, and *u*, and these two Consonants *l* and *r*; and therefore we must not write *kare* for *care*, *kow*, for *cow*, *krown* for *crown*: And the Use of *K* is only before *e, i*, and *u*; wherefore we must write *keep, key, knight, kill*, &c. not *ceep, cey, cnight*, nor *cill*. But the words *Calendar* and *Catharine* are written sometimes *Kalendar*, or *Katharine*. *K* is written after *c* only in pure *English* Words, such as *back, deck, sick*, &c. for the best Authors have omitted it in Words derived from the *Greek* and *Latin*, such as *public, music, physic*, &c.

L is not sounded in *calf, half, chalk, stalk, walk*, those Words being pronounced as if written *caff, haff, chauk, stauk, wauk*. Neither is *l* sounded in *Holbourn Lincoln, salmon*, or *chaldron*; these are sounded as if writ, *Hoborn*, *Lincon, sammon*; nor in *Colonel*, where the first *l* hath the Sound of *r*, as *Cornel*.

In the Word *accompt*, *mp* is sounded like *un*.

N is scarcely heard in *autumn, lime-kiln, solemn, linen, hymn, column*, and *condemn*.

O is not sounded in *people, feoffe, righteous, jeopardy*. *O* sometimes sounds like *oo*; as in *doing, moving, proving*, &c.——*O* is sometimes sounded like *i*, as in *women*, pronounced *wimmin*. And sometimes *O* is sounded as *u*, as in *money, conduit, conjure, attorney, Monmouth*, as if written *munney, cunduit, cunjure, atturney, Munmuth*, &c. and it is sounded like *oo* in, *do, to, prove, move*, &c.

P is written, but not sounded, in *empty, presumptuous, psalm*, and *symptom*, &c.

Ph has the sound of *f*, when together in one Syllable; as in *philosophy, Physician, Asaph*, and *Elephant*; but we must not write *filosophy, fisician*, nor *Asaf*, or *Elefant*.

After *Q* always follows *u* in all Words: and in some *French* and *Latin* Words they have the Sound of *k*; as in *risque, liquor, catholique, conquer, masquerade, chequer*; pronounced as *risk, likker, catholik*, &c. to which add *oblique, relique, antique*, &c. which are sounded as if written *oblike, relik, anteke*, &c.

S is not sounded in *island, viscount, isle*, and *Lisle*: which are pronounced as if wrote *iland, vicount, ile*, and *Lile*.

Ti before a Vowel or a Diphthong, hath the Sound of *si* or *sh*, as in *patience, dictionary, oblation, nation, translation*; except when *s* goes just before it, as in these Words, *question, fustian, bastion, combustion, celestial*, &c. But in some Words of *Hebrew* and *Greek*, it retains its natural Sound, as in *Shealtiel, Phaltiel*, and the like; and in the *English* Derivatives *mightier, emptied, pitiable*, &c.

U is sounded like *e* in *bury, berry*; like *i* in *busy, bizzy*. *U* is sometimes written after *g* without being sounded, as in *guide, guard*, &c. It is also silent in the Words, *buy, built, conduit, circuit, labour, favour, honour*, &c. but it is sounded in others, as *anguish, languish, Montague*, &c.

W is not sounded in *answer, sword*, &c. neither is it heard before *r* in *wrap, wrath, wrong, wretch, wrangle, wriggle*, &c.

Wh belongs to Words purely *English*; as *what, when, where*, and *Wheel*.

X is sounded as *z* in *Xenophon, Xerxes, Xenocrates,* and *Xantippe.*

Y is either a Vowel or Consonant as hinted before: A Vowel in *my, by, fly, thy.* In Derivative *English* Words, having the Termination *ing, y* is used in the Middle of the Word, as in *buying, dying, burying, marrying,* &c.

The Diphthongs *ai* and *ay,* have the Sound of an *a* in *air, fair, pair, may, stay, play;* but *a* is lost in *Calais* (a Town in *France*) and pronounced separately in *Sinai* (a Mountain of *Arabia.*)

Ei and *ey* are sounded like *a* in *eight, streight, neighbour, heir, veil,* and *convey;* like *e* in *key;* and like *i* in *sleight.*

Oi and *oy* have a sound peculiar to themselves; as in *oil,* and *oyster.*

Au and *aw* commonly keep a proper Sound, as in *augur, daw, saw,* &c. but *u* is lost in *aunt* and *gauger*, being sounded as *ant* and *gager;* they make no Diphthong in *Em-ma-us* and *Ca-per-na-um.*

Eu and *ew* have an united Sound in most Words, as in *eunuch, brew, new, grew,* but *eu* is no Diphthong in *Zac-che-us* and *Bar-ti-me-us.*

Ou is expressed in *foul, soul, proud, loud;* and *ow* in *how, cow,* and *now;* but *ou* sounds like *oo* in *soup.*

Ee is no Diphthong in *Be-er-she-ba,* and in Words beginning with *re,* or *pre;* as *re-en-ter, pre-e-mi-nence;* in *Beelzebub* one of the *e's* is not sounded.

Oo is properly sounded in *cool, fool, pool, root,* and *tool,* but hath the sound of *u* in *foot* and *soot;* it makes no Diphthong in *Co-os, co-o-pe-rate,* &c.

Ea sounds like *e* in *sea, pea, ream, seam, bread, head, lead, dead, leather, feather, heaven, leaven,* and *creature:* it is no Diphthong in *Ce-sa-re-a, i-de-a, re-al, be-a-ti-tude, cre-a-tor;* nor in Words beginning with *pre,* as *pre-am-ble,* &c.

Eo, is no Diphthong in *dun-ge-on, hi-de-ous, me-te-or, pi-ge-on, the-o-ry,* &c.

Oa is sounded as *o,* in *goat, boat, coat;* it is sounded broad, as *au,* in *broad* and *groat,* but it is no Diphthong in *Go-a* (a city in *India*) or in the *Hebrew* Words *Zo-ar,* and *Gil-bo-a.*

Ie before a single Consonant sounds like *ee,* as in *brief, chief,* and *thief;* but if before two Consonants, it sounds like *e,* as in *friend, field;* but at the End of *English* Words the *e* is not heard, as in *die,* or *lie;* it is no diphthong in

A-bi-e-zer, E-li-e-zer; nor in the *English* Words *car-ri-er*, *clo-thi-er*; nor in Words derived from the *Latin*, as *cli-ent*, *o-ri-ent*, *qui-et*, and *sci-ence*.

Ui is sounded as *u*, in *juice*, *fruit*, and *suit*; but *u* is lost in *conduit*, *built*, and *guise*, and is no Diphthong in *je-su-it*, *ge-nu-ine*, and *fru-i-ti-on*.

Æ and *Œ* are not *English* Diphthongs; they are used in *Æsop*, *Cæsar*, *Œdipus*, and sound like *e*; but in common Words they are neglected, as in *equity*, *female*, and *tragedy*, though derived of *æquitus*, *fæmina*, and *tragœdia*.

OF SYLLABLES AND THEIR DIVISION, BEING THE ART OF SPELLING.

A SYLLABLE is a sound pronounced by a single impulse of the voice as *vir-tue*, so that *virtue* being thus divided, or taken asunder, makes two *Syllables*, viz. *vir-* and *tue*; which, put together, form the Word *virtue*. And many Times a Vowel, or a Diphthong of themselves, make a *Syllable*, as in *a-bate*, *e-ve-ry*, *i-dle*, and in *au-ger*, *eid-er*, *oy-ster*, *oak-en*:

No *Syllable* can be made, be there ever so many *Consonants*, or so few, without the aid of a *Vowel* or *Diphthong*.

The longest *Monosyllables* we have in *English*, are *length*, *strength*, and *straight*; which could not be sounded without the Vowel *e* or *i*.

The Art of Spelling may be reduced to these four following general Rules or Heads.

1*st*. When a consonant comes between two Vowels in dividing the Words into *Syllables*, the *Consonant* is joined to the latter *Vowel*; as in *sta-ture*, *na-ture*, *de-li-ver*, *a-ni-ty*, &c. except compound Words, which terminate in *ed*, *en*, *est*, *eth*, *er*, *ing*, *ish*, and *ous*; as *coast-ed*, *gold-en*, *know-est*, *know-eth*, *bear-er*, *bar-bar-ous*, *fool-ish*, *ra-ven-ous*, and *sub-urbs*.

2*dly*. When two *Consonants* come together in the Middle of a Word, they are to be parted, if not proper to begin a Word; as *num-ber*, *stran-ger*, *for-tune*, &c. not *numb-er*, *strang-er*, *fort-une*. When the same *Consonant* is doubled in a Word, the first belongs to the foregoing, and the latter to the following Syllable, as in the Rule above, and in these Words, *Ab-ba*, *ac-cord*, *ad-der*, &c.

3*dly*. *Consonants* that begin Words must not be parted in the Middle; as, *a-gree, be-stow, re-frain,* &c. not *ag-ree, bes-tow, ref-rain.*——These *Consonants* may begin Words, *viz. bl, br, ch, cr, dr, dw, fl, fr, gh, gl, gr, kn,* &c. as *blunt, break, chaw, cry, draw, dwelt, flesh, ghost,* &c.

4*thly.* When two Vowels come together, not making a Diphthong, they must be divided, as in *vi-al, va-li-ant, Li-o-nel, du-el, cru-el, me-te-or,* and *La-o-di-ce-a.*

Some particular Notes.

L is doubled in Words of one Syllable, as *well, tell, swell, ball, wall, fall, will, hill, mill,* &c. But in Words of more than one Syllable, the Word always terminates with single *l,* as *angel, Babel, hurtful, beautiful,* and *dutiful.* Neither must *l* be doubled in *always, also, although;* not *allways, allso, allthough,* &c. but Words accented on the last Syllable must be excepted from the Rule above, *viz. install, recall, inroll, rebell,* and *repell.*

Y must be used before the Termination *ing,* as *buying, lying, carrying, paying, slaying, burying,* &c.

If you cannot write out the whole Word at the end of the Line, you must break it off at the End of a Syllable, thus————————————————con-
demn.

C must not be put between two Consonants; as *think,* not *thinck; thank,* not *thanck;* but if a Vowel goes before *k,* you must write *c* before *k,* as *brick, thick, stick,* &c.

Of *S* and *C,* Some people may easily drop into Error by mistaking *S* for *C,* as in the Beginning of the following Words, where *C* hath the perfect Sound of *S,* though *C* must be undoubtedly written; *viz.* in

Cieling
Celestial
Civet
Certain
Cymbal
Cistern
Centurion

Cinnamon
Ceremony
Cellar
Censure
Censor
Cease
Celebrate

Cell
Censer
Celerity
Cypress
Circle
Circuit
Cement

Ceruse
Centre
Cinque
Cypher
City
Citron
Cymon

These Words must be written with *S* and *C, viz.*

Science
Schedule

Sceptre
Scheme

Scarcity
Schism

Sciatica
Scythian.

The following Words should be written

with ti	*with* si
Contention	Confusion
Action	Occasion
Contradiction	Contusion
Attention	Oppression
Benediction	Allusion
Apparition	Ascension
Concoction	Aversion
Declaration	Aspersion
Ambition	Commission
Contrition	Comprehension
Oration	Circumcision
Oblation	Conclusion

The following Words should be spelt thus:

Passion, *not* Pashon
Fashion, *not* Fation
Cushion, *not* Cution
Gloucester, *not* Gloster
Worcester, *not* Worster
Salisbury, *not* Salsbury
Leicester, *not* Lester
Shrewsbury, *not* Shrusbury
Carlisle, *not* Carlile
Westminster, *not* Westmister.

Another Qualification in Spelling is, rightly to distinguish Words of the *same Sound*, or *nearly the same Sound*, though widely different in their Sense and Signification; such are these that follow:

ABEL, *Cain's* Brother
Able, to do a Thing
Accidents, Chances
Accidence, in Grammar
Acre, of Land
Achor, a Valley of that Name.
Advice, Counsel
Advise, to counsel
Account, Esteem
Accompt, or Reckoning
Ale, a Drink
Ail, Trouble
All, every one
Awl, for Shoemakers
Allay, to give Ease
Alloy, base Metal
Altar, for Sacrifice
Alter, to change
Alehoof, an Herb
Aloof, at a Distance
Allow'd, approv'd
Aloud, to speak so
Ant, a Pismire
Aunt, a Father's Sister
Anchor, of a Ship
Anker, a Runlet
Are, they be
Air, we breathe
Heir, to an Estate
Arrant, notorious
Errand, a Message
Arras, Hangings
Harass, to fatigue
Ascent, a going up

Assent, Agreement
Assistance, Help
Assistants, Helpers
Augur, a Soothsayer
Augre, to bore with
Ax, to cut with
Acts, of Parliament

B

Bacon, Hog's Flesh
Baken, in the Oven
Beckon, to make a Sign
Beacon, to be fired on a Hill
Bail, a Surety
Bale, of Goods
Bald, without Hair
Bawl'd, cried out
Ball, to play with
Bawl, to cry aloud
Barbara, a Woman's Name
Barbary, in Africa
Barberry, a Fruit
Bare, naked
Bear, a Beast, or to bear
Bays, of Bay-trees
Baize, Cloth
Base, vile
Bass, in Musick
Be, they are
Bee, that makes Honey
Beer, to drink
Bier, to carry the Dead on
Bell, to ring
Bel, an Idol
Berry, a small Fruit
Bury, the Dead
Blue, a Colour
Blew, as the Wind
Board, a Plank
Bor'd, a hole
Boar, a Beast
Bore, to make hollow
Boor, a Country Fellow
Bold, confident
Bowl'd, at the Jack
Bolt, the Door
Boult, the Meal
Beau, a Fop
Bow, to bend, or the Bow
Bough, of a Tree
Boy, a Lad
Buoy, of an Anchor
Bread, to eat
Bred, brought up
Breeches, to wear
Breaches, broken places
Bruit, a Noise
Brute, Beast
Burrow, for Rabbits
Borough, a Corporation
By, near
Buy, with Money
Brews, he breweth
Bruise, a Hurt
Buss, a fishing Vessel
Buz, the Noise of a Fly.

C

Cain, that killed his Brother
Cane, to walk with
Caen, in Normandy
Calais, in France
Chalice, a Cup
Call, by Name
Cawl, Suet
Cannon, a great Gun
Canon, a Rule
Canon, of a Cathedral
Capital, great or chief
Capitol, a Tower in Rome
Career, full Speed
Carrier, of Goods
Cellar, for Liquors
Seller, that selleth
Censer, for Incense
Censor, a Reformer
Censure, to judge
Centaury, an Herb

Century, an Hundred Years
Sentry, a Soldier on Guard
Chair, to sit on
Chare, a Job of Work
Champaine, Wine of *France*
Campaign, a wide Field or Summer's Expedition
Choler, Rage or Anger
Collar, of the Neck
Coller, of Beef or Brawn
Cieling, of a Room
Sealing, with a Seal
Cittern, for Musick
Citron, a Fruit
Clause, Part of a Sentence
Claws, of a Beast or Bird.
Coat, a Garment
Cote, for Sheep
Commit, to do
Comet, a blazing Star
Condemn, to Death
Contemn, to despise
Council, of the King
Counsel, Advice
Coarse, not fine
Course, to be run
Cou'd, or could
Cud, to chew as Beasts
Current, a running Stream
Courant, a Messenger or News-paper
Currants, Fruit
Crick, in the Neck
Creek, of the Sea or River
Cousin, a Relation
Couzen, to cheat
Cymbal, a Musical Instrument
Symbol, a Mark or Sign
Cypress, a Tree
Cyprus, an Island
Cruse, for Oil
Cruise, by the Sea-coast.
Cygnet, a young Swan
Signet, a Seal

D

Dane, an Inhabitant of *Denmark*
Deign, to vouchsafe
Dam, stopping Water
Damn, to condemn
Dame, a Mistress
Dear, in Price
Deer, in a Park
Deceased, dead
Diseased, sick
Decent, becoming
Descent, going down
Dissent, to disagree
Deep, low in Earth
Dieppe, a Town in *France*
Defer, to put off
Differ, to disagree
Derbe, a City of *Asia*
Derby, a Town in *England*
Desert, Merit
Desart, Wilderness
Dew, a falling Mist
Due, owing
Do, to make
Doe, a Female Deer
Dough, Paste
Don, a *Spanish* Lord
Done, acted
Dun, of Colour
Devices, Inventions
Devizes, a Town in *Wiltshire*
Doer, that doeth
Door, of a House
Dragon, a Beast
Dragoon, a Soldier
Dolour, Grief or Pain
Dollar, a Piece of Money
Demure, sober
Demur, a Stop or Doubt

Ear,

E

Ear, of the Head
E'er, ever
Year, twelve Months
Yearly, every Year
Early, betimes
Earth, the Ground
Hearth, of the Chimney
Easter, the Festival
Esther, a Woman's Name
Enter, to go in
Inter, to bury
Elder, not the Younger
Elder, a Tree
Eaten, or swallowed
Eaton, a Town's Name
Eminent, famous
Imminent, over Head
Enow, in Number
Enough, in Quantity
Earn, to deserve
Yarn, Woollen-Thread
Yearn, to pity
East, the Wind
Yeast, used in making Bread
Envy, or Hatred
Envoy, a Messenger
Exercise, Labour or Practice
Exorcise, to conjure
Err, to mistake
Er, Brother to *Onan*
Extant, in being
Extent, Distance

F

Fain, desirous
Feign, to dissemble
Fair, beautiful, or a Market
Fare, Victuals
Faint, weary
Feint, a Pretence
Fourth, in Number
Forth, to go out
Feed, to eat
Fee'd, rewarded
Fir, Wood
Fur, or Hair
Felon, a Criminal
Fellon, a Whitlow
File, of Steel
Foil, put tothe worst
Fly, as a Bird
Fly, an Insect
Fillip, with the Fingers
Philip, a Man's Name
Flower, of the Field
Flour, Meal
Floor, of a Room
Follow, to come after
Fallow, Ground not plough'd
Find, to find any Thing
Fin'd, amerced
Fiend, Devil
Flea, off the Skin, and also a Vermin
Flee, to escape
Flue, of a Chimney
Flew, did fly
Fowl, a Bird
Foul, dirty
Francis, a Man's Name
Frances, a Woman's Name
Frays, Quarrels
Fraize, Pancake with Bacon
Frize, a Sort of Cloth
Freeze, with Cold

G

Gall, of a Beast
Gaul, France
Garden, of Herbs
Guardian, an Overseer
Genteel, graceful
Gentile, a Heathen
Gentle, mild
Gesture, Carriage
Jester, a merry Fellow

Groan, with Grief
Grown, greater
Guilt, of Sin
Gilt, with Gold
Greater, bigger
Grater, for Nutmegs
Grave, for the Dead
Greave, Armour for the Leg
Gluttonous, greedy
Glutinous, sticking as Pitch
Great, large
Grate, for Coals, &c.
Greet, to salute
Graze, to eat Grass
Grays, a Town
Groat, Four-pence
Grot, a Cave
Gallies, Ships with Oars
Gallows, for Criminals

H

Hare, in the Field
Hair, of the Head
Heir, to an Estate
Harsh, severe
Hash, minced Meat
Haven, a Harbour
Heaven, a Place of Happiness
Heart, of the Body
Hart, in the Woods, or an over-grown Buck
Herd, of Cattle
Heard, did hear
Hard, not soft, or difficult
Here, in this Place
Hear, with the Ears
High, lofty
Hie away, make haste
Hoy, a small ship
Him, that Man
Hymn, a spiritual Song
Hail, congealed Rain
Hale, to call
Hall, in the House
Haul, pull
Heel, of the Foot
Heal, to cure
He'll, he will
Higher, taller
Hire, Wages
His, of him
Hiss, as a Snake, or to derid
Hoar, a Frost
Whore, a lewd Woman
Hole, or Hollowness
Whole, entire
Hallow, to make holy
Hollow, having a cavity
Holy, pious
Wholly, entirely
Holly, a Tree
Home, one's House
Whom? What Man?
Holm, Holly
Hoop, for a Tub
Whoop, or ho! lo!
Hugh, a Man's Name
Hue, of Colour
Hew, with an Ax

I

I, I myself
Eye, to see with
Idle, lazy
Idol, an Image
I'll, I will
Ayle, of a Church
Isle, an Island
Oil, of Olives
In, within
Inn, for Travellers
Incite, to stir up
Insight, Knowledge
Ingenious, of quick Parts
Ingenuous, candid
Itch, a Distemper
Hitch, to catch hold

Ketch,

K

Ketch, a Ship
Catch, to lay hold of
Kill, to slay
Kiln, for Lime
Kind, good-natured
Coin'd, Money
Knave, dishonest
Nave, of a Wheel
Knight, by Honour
Night, Darkness
Kennel, for Dogs
Channel, for Water

L

Laid, placed
Lade, the Water
Lane, a narrow Street
Lain, did lie
Latin, a Language
Latten, Tin
Ladder, to ascend
Lather, made with Soap
Lettice, a Woman's Name
Lettuce, a Sallad
Lease, of a House
Leash, Three
Lees, of Wine
Leese, an old Word for lose
Leaper, that jumpeth
Leper, one leprous
Lessen, to make less
Lesson, to be read
Least, smallest
Lest, for fear
Lethargy, Sleepiness
Liturgy, Church Service
Lier, in wait
Liar, that tells Lies
Limb, a Member
Limn, to paint
Line, Length
Loin, of Veal
Liquorish, fond of Dainties
Liquorice, a plant, or its Root
Low, humble
Lo! behold
Lose, to suffer Loss
Loose, to let go
Lower, to let down
Lour, a Frown
Loathe, to abhor
Loth, unwilling

M

Made, finished
Maid, a young Woman
Main, Chief
Mane, of a Horse
Male, the He
Mail, Armour
Manner, Custom
Manor, a Lordship
Market, to buy or sell in
Marked, noted
Marsh, low Ground
Mash, for a Horse
Mesh, of a Net
Martin, a Man's Name
Marten, a Bird
Mead, a Meadow
Mede, one of *Media*
Mean, of low Value
Mien, Carriage or Aspect
Meat, to eat
Meet, fit
Mete, to measure
Message, Business
Messuage, a House
Mews, for Hawks
Muse, to meditate
Mighty, powerful
Moiety, Half
Mile, Measure
Moil, to labour
Might, Strength
Mite, in Cheese
Moat, a Ditch

Mote, in the Sun
Moan, to lament
Mown, cut down
More, in Quantity
Moor, a Black
Mower, that moweth
Moor, barren Ground
Mortar, made of Lime
Mortar, to pound in
Mole, a Vermin
Mould, to cast in
Muscle, a shell Fish
Muzzle, to cover the Mouth

N

Nay, denial
Neigh, as a Horse
Neither, none of the two
Nether, lower
New, not old
Knew, did know
Naught, bad
Nought, nothing
Nice, curious; also a Town
Niece, a Brother's Daughter
Not, denying
Knot, to tie
Note, mark
Note, of one's Hand
Nose, of the Face
Knows, understands
No, Denial
Know, to understand
Neal, to harden Glass
Kneel, on the Knees
None, not one
Known, understood
News, tidings
Noose, a Snare

O

Oar, of a Boat
Ore, crude Metal
O'er, over
Off, cast off
Of, belonging to
Our, belonging to us
Hour, of the Day
Oh! alas!
Owe, in Debt
One, in Number
Won, at Play
Own, to acknowledge
Order, Rule
Ordure, Dung

P

Pair, a Couple
Pare, cut off
Pear, a Fruit
Pain, Anguish
Pane, of Glass
Patten, for a Woman
Patent, a Grant
Peer, a Lord
Pier, of *Dover*
Peter, a Man's Name
Petre, Salt
Pail, for Water
Pale, of Countenance
Pale, a Fence
Pall, for a Funeral
Paul, a Man's Name
Plait, the Hair
Plate, Metal
Place, Room
Plaice, a Fish
Parson, of the Parish
Person, any Man
Pole, for Hops
Pole, of the Head
Pool, of Water
Pore, with the Eyes, or of the Skin
Poor, necessitous
Palate, of the Mouth
Pallet, Bed
Palliate, to cover or hide
Point, a Stop

Pint, Half a Quart
Posy, a Nosegay,
Poesy, Poetry
Power, might
Pour, as Water
Prey, a Booty
Pray, to beseech
Profit, Gain
Prophet, a Foreteller
Prophecy, a Foretelling
Prophesy, to foretel
Practice, Exercise
Practise, to exercise
Presence, being here
Presents, Gifts
Prince, the King's Son
Prints, Drawings
Please, to content
Pleas, Excuses or Defences
Precedent, an Example
President, Chief
Principal, Chief
Principle, the first Rule

Q

Quire, of Paper
Choir, of Singers
Queen, the King's Wife
Quean, a bad woman

R

Rack, to torment
Wreck, of a Ship
Arrack, a strong Liquor
Rain, Water
Reign, of the King
Rein, of a Bridle
Rays, of the Sun
Raise, lift up
Raisin, a Fruit
Reason, Argument
Race, to run
Rase, to demolish
Rice, Grain
Rise, to get up
Read, the Book
Reed, growing in the Water
Relic, a Remainder
Relict, a Widow
Roe, of a Fish, or Deer
Row, the Boat
Right, not wrong
Rite, a Ceremony
Write, with a Pen
Wright, a Wheelwright
Reddish, Colour
Radish, a Root
Rest, Quiet
Wrest, to prevent
Roof, the Top of an House
Ruff, for the Neck
Rough, not smooth
Rie, Corn
Rye, a Town in *Sussex*
Wry, crooked
Ring, the Bells
Wring, the Hands
Rime, a Fog or Mist
Rhyme, Verse
Rode, did ride
Road, the Highway
Row'd, did row
Room, Part of a House,
Rome, the Name of a City
Roam, to wander
Rheum, a Humour
Rote, got by Heart
Wrote, did write
Wrought, did work

S

Salary, Wages
Celery, an Herb
Savour, Taste or Smell
Saviour, that saves
Satiety, Fulness
Society, Company
Sheep, a Beast
Ship, for the Sea

Sight, View
Cite, to summons
Site, Situation
Sail, of a Ship
Sale, of Goods
Sea, the Ocean
See, with the Eyes
Seam, in a Coat
Seem, appear
Seen, beheld
Scene, in a Play
Seas, great Waters
Seize, to lay hold of
Cease, to leave off
Sent, did send
Scent, a Smell
Shew, to make appear
Shoe, for the Foot
Sink, sink down
Cinque, five
Slight, to despise
Sleight, of an Hand
Shour, a Prop
Shore, the Sea Coast
Sewer, a common Drain
Shown, view'd
Shone, did shine
Slow, not quick
Sloe, Fruit
Sew, with a Needle
Sue, at law
Sow, Seed
So, thus
Some, a Part
Sum, of Money
Soul, or Spirit
Sole, a Fish
Soal, of a Shoe
Son, of a Father
Sun, in the Firmament
Sore, painful
Soar, aloft
Swore, did swear
Sword, a weapon
Soar'd, did soar
Stare, to look earnestly at
Stair, a Step
Stile, to get over
Style, of Writing
Sound, whole, firm; also Noise
Swoon, to faint away
Soon, quickly
Statue, an Image
Statute, a Law
Stature, Height
Stead, in Place
Steed, a Horse
Straight, not crooked
Strait, narrow
Succour, Help
Sucker, a Young Sprig
Spear, a Weapon
Sphere a Globe

T

Then, at that Time
Than, in comparison
Tame, gentle, not wild
Thame, a Town in *Oxfordshire*
Tear, to rend
Tear, of the Eye
Tare, an Allowance in weight
Tare, Vetch
Tail, of a Beast
Tale, a Story
Tiles, for the House
Toil, to labour
Toil, a net
There, in that Place
Their, of them
Through, compleat
Throw, a Stone
Throne, of the King
Thrown, as a stone
Tide, a flowing water
Ty'd, made fast

Thyme,

Time, of the Day
Thyme, an Herb
Team, of Horses
Teem, with Child
To, the Preposition
Toe, of the Foot
Tow, to be spun, to draw
Too, likewise
Two, a Couple
Told, as a story
Toll'd, as a Bell
Tour, a Journey
Tower, of a Church

V

Vacation, Leisure
Vocation, a Calling
Veil, a Covering
Vale, between two Hills
Vain, foolish
Vein, of the *Body*
Vane, a Weathercock
Value, Worth
Valley, a Vale
Vial, a Glass
Viol, a Fiddle

U

Your, of you
Ewer, a Bason
Use, Practice
Use, to be wont
Ewes, Sheep

W

Wages, pay for service
Wagers, Betts
Wade, in the Water
Weigh'd, in the Scales
Whale, of the Sea
Wail, lament
Waist, the Middle
Waste, to spend
Wait, to stay for
Weight, Heaviness
Wear, Clothes
Ware, Merchandize
Were, Was
Where, what Place
Weighed, to poise
Wey, five quarters
Whey, of Milk
Weal, good
Wheal, from Scourging
Wield, a Sword
Weald, of *Sussex*, or *Kent*
Wen, in the Neck
When, at what Time
White, of Colour
Wight, an Island
Whore, a lewd Woman
Hoar, Frost
Witch, that conjures
Which, who, or what
Whist, Silence
Whist, a Game
Wist, knew
Won, did win
One, the first Number
Wood, of Trees
Wou'd, or would

Y

Yea, yes
Ye, yourselves
You, yourselves
Yew, a Tree
You, yourselves
Yarn, made of Wool
Yearn, to pity

OF STOPS, AND OTHER MARKS, USED IN READING AND WRITING.

THESE are of absolute Necessity; and great Regard ought to be had to them, for the better understanding of what we read and write ourselves; they are likewise of use to others who shall hear us read, or see our Writing.

Stops, or Pauses, considered as Intervals in Reading, are no more than four; though there are other Marks to be taken notice of. The Names of the four Stops are, a *Comma, Semicolon, Colon,* and *Period,* or *Full Stop:* and these do bear to one another a kind of progressional Proportion of Time; for the *Comma* signifies a Stop of leisurely telling one, the *Semicolon* two, the *Colon* three, and the *Period* four—And are made or marked thus:

Comma, (,) at the Foot of a Word.
Semicolon, (;) a point over the Comma.
Colon (:) two Points
Period (.) a single Point at the Foot of a Word.

, *Example of the* Comma (,) There is not any thing in the World, perhaps, that is more talked of, and less understood, than the Business of a happy Life.

; *Example of a* Semicolon (;) The orator makes the Truth plain to his hearers; he awakens them; he excites them to action; he shews them their impending Danger.

: *Example of the* Colon (:) A sound Mind is not to be shaken with popular Applause: but Anger is startled at every Accident.

. *Example of the* Period (.) It is a Shame, says *Fabius,* for a Commander to excuse himself, by saying, "I was not aware of it." A Cruelty that was only fit for *Marius* to suffer, *Sylla* to command, and *Cataline* to act.

By the foregoing Examples we may easily note, that a *Comma* is a Note of a short pause between Words in the Sentence; and therefore the Tenor of the Voice must still be kept up.—The *Semicolon* is a little longer, and the Time of the Voice very little abated—The *Colon* signifies perfect Sense, though not the End of the Sentence; and the voice somewhat abated.—The *Period* denotes perfect Sense, and the End of the Sentence.

? When the Question is asked, there is a crooked Mark made over the Period, thus ? and is called a Note of Interrogation. *Example*, What could be happier than the State of Mankind, when People lived without either Avarice or Envy ? The time of Pause for this Stop is the same with the *Semicolon*.

! If a sudden Crying-out, or Wondering be expressed, then this Mark is made over the Full Stop, thus ! and called a Note of Admiration, or Exclamation. *Example*, Oh the astonishing Wonders that are in the Starry Heavens !

( ) If one Sentence be within another, of which it is no Part, then it is placed between two Semicircles or Parentheses, made thus ( ), *Example*, *Pompey* on the other side (who hardly ever spoke in public, without a Blush) had a wonderful Sweetness of Nature. Again : Of Authors be sure to make Choice of the best, and (as I said before) stick close to them. In reading a Parenthesis, the Tone must be somewhat lower, as a Thing or matter that comes in by the bye. The Time is equal to a Comma, and ought to be read pretty quick, lest it detain the Ear too long from the Sense of the more important Matter.

’ *Apostrophe*, is a Comma at the Head of Letters, signifying some Letter or Letters left out in Poetry, as *would’st* for *wouldést*, *ne’er* for *never*, *’tis* for *it is*, *o’er* for *over*. Or to denote a Genitive Case ; as my Father’s House, my Uncle’s Wife, *&c*.

´ *Accent* is placed over a Vowel, to denote that the Stress or Sound in Pronunciation is on that Syllable.

˘ *Breve*, or crooked mark over a Vowel, signifies it must be sounded short or quick.

‸ *Caret* signifies something is wanting, and is placed underneath the Line, just where any thing omitted should be brought in.

^ *Circumflex* is of the same shape with a Caret, but is placed over some Vowel, to show that the syllable is long, as *Eu-phrâ-tes*.

¨ *Diæresis*, two points placed over Vowels, to signify they are parted, being no Diphthong, as *aërial*.

- *Hyphen* or *Note of Connection* is a strait Line ; which shews that the Syllables of a word are parted, and the Remainder of it is at the Beginning of the next Line. Sometimes the Hyphen is used in Compound Words, as Heart-breaking, Book-keeper. When you have not Room to write the whole Word at the end of a Line, but are obliged to finish it at the Beginning of the next, such Words must be truly divided, according to the Rules of Spelling.

☞ *Index* is a Note like a Hand, pointing to something very remarkable

* *Asterism* or *Star*, directs to some Remark in the Margin, or at the Foot of the Page. Several of them together to denote something defective in that passage of the Author.

† *Obelisk* is a Mark like a Dagger, and refers to the Margin, as the *Asterism*: And in Dictionaries it signifies the Word to be obsolete or old, and out of Use.

¶ *Paragraph* denotes a Division, comprehending several Sentences under one Head.

§ *Section* signifies the Beginning of a new head of Discourse, and it is used in Subdividing a Chapter, or Book, into lesser Parts or Proportions.

[ ] *Brackets* or *Crotchets*, generally include a Word or Sentence, explanatory of what went before; or words of the same Sense, which may be used in their stead.

" *Quotation*, or double Comma inverted, is used at the Beginning of the Line, and shews what is quoted from an Author to be his own Words, as an excellent Poet says,

"The proper Study of Mankind is Man."

OF ABBREVIATIONS.

TO be ready in these shews a Dexterity in Writing; and is very necessary for Dispatch; for by these we expeditiously express, or set down a Word, shortening it by making some initial Letter or Letters, belonging to the Word, to express it, as in the Table following:

A. B.	Bachelor of Arts
A. Bp.	Archbishop
A. D.	Anno Domini, Year of our Lord
A. M.	Anno Mundi, Year of the World
Adm.^{rs}.	Administrators
A. M.	Artium Magister, Master of Arts
Ana,	of each a like Quantity
Adm^{l}.	Admiral
Aug.	August
A. R.	Anno Regni, in the Year of the Reign
Ast. P. G.	Astronomy Professor at Gresham College
B. A.	Bachelor of Arts
B. D.	Bachelor of Divinity
B. V.	Blessed Virgin
Bar^{t}.	Baronet
Bp.	Bishop
Cant.	Canticles, or Canterbury
Chap.	Chapter

Cent. Centum
Chron. Chronicles
Capt. Captain
Col. Colossians
Cl. Clericus
Col. Colonel
Cor. Corinthians or Corollary
Cr. Creditor
C. C. C. Corpus Christi College
C. S. Custos Sigilli, Keeper of the Seal
C. P. S. Custos Privati Sigilli, Keeper of the Privy Seal
Dr. Doctor or Debtor
Do. Ditto or the same.
Deut. Deuteronomy
Dec. Deceased
D. D. Doctor of Divinity
E. Earl
Earld. Earldom
Ex. gr. or *e. g.* Exempli gratia. for Example
Eph. Ephesians
Eccl. Ecclesiastes
Ex. Exodus or Example
Esq. Esquire
Exon, Exeter
Feb. February
F. R. S. Fellow of the Royal Society
Gal. Galatians
Gen. Genesis
Gen^{mo}. Generalissimo
G. R. George Rex, George the King
Gen. General
Gent. Gentleman
Heb. Hebrews
i. e. Id est, that is
I. H. S. Jesu Hominum Salvator, Jesus Saviour of Men
Ib. ibidem in the same Place
Id. Idem. the same
Jan. January
Jer. Jeremiah
Judg. Judges
J. D. Jurium Doctor, Doctor of Laws
Jos. Joshua
Knt Knight
l. Liber, a Book
L. Libræ, Pounds
Lieut. Lieutenant
LL. D. Legum Doctor, Doctor of Laws
Lam. Lamentations
Lev. Leviticus
L. C. J. Lord Chief Justice
M. Thousand
Mar. March
Mat. Matthew
m. Manipulus, a Handful
M. A. Master of Arts
Mons. Monsieur
Mr. Master
Mrs. Mistress
M. D. Medicinæ Doctor, Doctor of Physic
M. S. Memoriæ Sacrum, Sacred to the Memory
MS. Manuscript
MSS. Manuscripts
Mich. Michael, or Michaelmas
N. B. Nota Bene, Note, or mark well
N. S. New Stile
No. Number
Nov. November
O. S. Old Style
Oct. October
Oxon, Oxford
Pugil, a Handful
Pd. Paid
Parl. Parliament

Philo Math. Philo Mathematicus, a Lover of the Mathematics
P. M. G. Professor of Music at Gresham College
Prof. Th. G. Professor of Divinity at Gresham College
Ps. Psalm
P. S. Postscript
Penult. last save one
Q. Query.
q. d. quasi dicat, as if he should say
q. l. quantum libet, as much as you please
q. s. quantum sufficit, a sufficient Quantity
qr. Quarter or a Farthing.
Rev. Reverend, or Revelation
Reg. Prof. Regius Professor
Rom. Romans
Rt. Hon^{ble}. Right Honourable
Rt. Worp^{l}. Right Worshipful
St. Saint, or Street
Sect. Section
Sept. September
Serj. Serjeant
Salop, Shropshire
ss. Semissis, half a Pound
S. T. P. a Professor or Doctor of Divinity
Thess. Thessalonians
V. Virgin, or Verse
Ult. *Ultimus,* the last
Vid. see
Viz. Videlicit, to wit, or that is, to say
V. gr. Verbi Gratia, for Example
X^{n}. Christian
X^{t}. Christ
Xtopher. Christopher
y^{e}. the
y^{n}. then
y . them
y^{t}. that
y^{r}. your
&, et, and
&c. et cetera, and the rest, or, and so forth

I shall now proceed to give some Instructions in relation to the most useful Art of Writing.

DIRECTIONS *to* BEGINNERS *in* WRITING.

FIRST, it is necessary to be provided with the following Implements, *viz.* good Pens, and Ink, and Paper; likewise a flat Ruler for Sureness; and a round one for Dispatch; with a leaden Plummet or Pencil to rule lines.

To hold the Pen.

THE Pen must be held somewhat sloping, with the Thumb and the two Fingers next to it; the Ball of the Middle-finger, must be placed straight just against the upper Part of the Cut or Cradle to keep the Pen steady: The fore-finger lying straight on the Middle-finger; and the Thumb must be fixed a little higher than the end of the Fore-finger bending in the Joint; and the Pen so placed as to be held easily without griping. The Elbow must be drawn towards the Body, but not too close. You must support your Hand by leaning on the Table-edge, resting it half way between your Wrist and Elbow, not suffering the Ball or fleshy Part of your Hand to touch the Paper; but resting your Hand on the End of your Little-finger, that and your Fore-finger bending inwards, and supported on the Table. So fixed, and sitting pretty upright, not leaning your Breast against the Table, proceed to the making the small *a*, and *c*, *e*, *i*, *m*, *r*, *s*, *w*, and *x*; which must be all made of equal Bigness and Height; the Distance or Width between the two Strokes of the *n* must be the same with the Distance or Width in the three Strokes of the *m*; the same Proportion of Width must be observed in the *u*, *w* and *o*. The Letters with Stems, or Heads, must be of equal Height; as the *b*, *d*, *f*, *h*, *l*, and *ſ*. And those with Tails must be of equal Depth, as the *f*, *g*, *p*, *q*, and *ſ*. The Capitals must bear the same Proportion to one another with respect to Bigness and Height, as *A*, *B*, *C*, *D*, *E*, *F*, *G*, *H*, and *I*, &c. All upright Strokes, and those leaning to the left Hand, must be fine, or Hair Strokes, and all downright Strokes must be fuller or blacker. Care must be duly taken, that there be an equal Distance between Letter and Letter, and also between Word and Word: The Distance between Word and Word may be the Space the small *m* takes up; but between Letter and Letter, not quite so much. Sit not long at writing, especially at the first, lest it weary you, and you grow tired of learning. Imitate the best Examples; and have a constant eye to your Copy; and be not ambitious of writing fast, before you write well: Expedition will naturally follow, when you have gained a Habit of writing fair and free; for it is much more commendable to be an Hour in writing six Lines well, than to be able to write sixty Lines in the same Time, which perhaps will be unintelligible. And besides, by a slow and fair Procedure you will learn in half the Time; and therefore it is vain in a Learner to desire to be quick before he hath acquired Experience, and a Freedom of Writing by frequent Practice. Never overcharge your Pen with Ink; but shake what is too much into the Inkstand again.

How

How to make a Pen.

THIS is gained sooner by Experience and Observation from others who can make a Pen well, than by verbal Directions. But before you begin to cut the Quill, scrape off the superfluous Scurf with the Back of your Penknife; scrape most on the Back of the Quill, that the Slit may be the finer. After you have scraped the Quill, cut it at the End, half through, on the Back Part, and then turning up the Belly, cut the other Part, or Half, quite through, *viz.* about a Quarter or almost half an Inch, at the End of the Quill, which will then appear forked. Enter the Penknife a little in the back Notch, and then putting the Peg of the Penknife-haft into the Back Notch (holding your Thumb pretty Hard on the Back of the Quill as high as you intend the Slit to be) with a sudden or quick Twitch, force up the Slit; it must be sudden and smart, that the Slit may be clearer. Then by several Cuts on each Side bring the Quill into equal Shape or form on both Sides; and having brought it to a fine Point, place the Inside of the Nib on the Nail of your Thumb, and enter the Knife at the Extremity of the Nib, and cut it through a little sloping, then with an almost downright Cut of the Knife, cut off the Nib. The Breadth of the Nib must be proportioned to the Breadth of the Body, or downright back Strokes of the Letters, in whatever Hand you write, whether Small or Text. *Note.* In sitting to write, place yourself directly against a fore-right Light, or else to have it on your left Hand, but by no Means to have the Light on the right Hand, because the Shadow of your Writing-hand will obstruct your Sight.

A B C D E F G H I J K L M N

O P Q R S T U V W X Y Z Æ

a b c d e f g h i j k l m n o p

q r ſ s t u v w x y z & &

&

Note, 'Tis neceſſary for all thoſe who would qualify themſelves for Buſineſs, often to imitate this Print-hand; to make clean Marks on Bales of Goods, or plain Directions on Parcels.

Copies in Alphabetical Order.

A. Art is gained by great Labour and Industry.
A covetous Man is always, as he fancies, in Want.
B. Beauty is commendable in some, but it ruins others.
By a Delight and some Care, we come to write fair.
C. Contentment is preferable to Riches and Honour.
Can they be counted wise, who Counsel do despise?
D. Deride not Infirmities, nor triumph over Injuries.
Delight in Virtue's Ways, and then you'll merit Praise.
E. Every Plant and Flower, shews to us GOD's Power.
Example oft doth rule, the wise Man and the Fool.
F. Fair Words are often used to hide bad Deeds.
Few do Good with what they have gotten ill.
G. Godliness with Contentment is great Gain.
Great Minds and small Means ruin many Men.
H. Hasty Resolutions are seldom fortunate.
Haste makes Waste of Paper, Ink, and Time.
I. Instruction and a good Education are a durable Portion.
Ignorance is the greatest Enemy to Learning.
K. Keep a close Mouth, if you'd have a wise Head.
Kings, as well as mean Men, must die.
L. Learn to live as you would wish to die.
Learn to unlearn what you have learn'd amiss.
M. Modesty has more Charms than Beauty.
Make Use of Time, now whilst you're in your Prime.
N. Necessity is commonly the Mother of Invention.
Next to a good Conscience prefer a good Name.
O. Opportunity neglected, brings severe Repentance.
Of all Prodigality, that of Time is the worst.
P. Poor Men want many Things, but covetous Men all.
Patience and Time run through the roughest Day.
Q. Quick Promisers are commonly slow Performers.
Qualify exorbitant Passions with Quietness and Patience
R. Remember your Duty to God, your Neighbour an
yourself.
Repentance comes too late when all is consumed.
S. Sin and Sorrow are inseparable Companions.
Self Love is the greatest Flatterer in the world.
T. The End of Mirth is often the Beginning of Sorrow.
Time is so swift of Foot, that none can overtake it.
V. Vain and transitory is all worldly Glory.
Virtue and Fortune work Wonders in the World.

W. Wisdom is more valuable than Riches.
What pleases GOD must be, none alters his Decree.
X. *Xenophon* was a great Captain as well as a Philosopher.
Xerxes whipt the Sea for not obeying his Command.
Y. Young Men lament your mis-spent time.
Your Time improve, squander it not away.
Z. Zeal mixt with Love is harmless as a Dove.
Zealously strive with Emulation to write.

Short Lines for Text Hand.

Abandon whatsoever's ill—Be wise betimes.
Care destroys the Body—Do the Things that are just.
Expect to receive as you give—Frequent good Company.
Give what you give chearfully—Hold good Men in Esteem.
Imitate that which is good—Keep God's Commandments
Learn to be wise—Make a right Use of Time.
Nothing get, nothing have—Observe Modesty.
Pleasures are very short—Pains are very long.
Quit all revenge—Quit your Passions.
Recompense a good Turn—Repent of your Sins.
Silence gives Consent—Sin not at all.
Time is more precious than Gold—Turn from your Sins.
Use moderate Pleasure—Use not bad Company.
Vain are some Pleasures—Vice is detestable.
Wisdom is the principal Thing—Wise Men are scarce.
Xenophon, Xenocrates.
Yesterday cannot be recalled.
Zebo and *Zenobia.*

Since good Ink is necessary to good Writing, I shall give a Receipt or two for making some of the best black Ink in the World, which is as follows, *viz.*

A Receipt for making black Ink.

TO six Quarts of Rain or River Water, put one Pound and a Half of fresh blue Galls of *Aleppo*, bruised pretty small; six Ounces of Copperas; also eight Ounces of clean, bright, and clear Gum Arabic. Let these stand together in a large Stone Bottle near a fire, with a narrow Mouth, to keep it free from Dust; shake, or stir it well, once every day, and you will have excellent Ink in about a Month's Time, and the older it grows the better it will be for Use.

Ingredients for a Quart.

One Quart of soft Water, four Ounces of Galls, one Ounce of Copperas, and two Ounces of Gum, mixed and stirred as above. The Galls must be bruised.

How to make Red Ink.

TAKE three Pints of stale Beer (rather than Vinegar) and four Ounces of Ground *Brazil* Wood; simmer them together for an Hour, dissolve half an Ounce of Gum Arabic in it, then strain it through a Flannel, and bottle it up (well stopped) for Use.

To keep Ink from Freezing or Moulding.

IN very severe Weather, Ink will be apt to freeze, which takes away all its Blackness and Beauty. To prevent which, put a Wine Glass of Brandy or other Spirits into a quart, and it will not freeze. And to hinder its moulding, put a little Salt in it.

FAMILIAR LETTERS ON SEVERAL OCCASIONS, AND ON DIVERS SUBJECTS.

LETTERS are variously worded, and ought properly to express the Desires, Thoughts, &c. of the Writer to the Reader, by which the Receiver of the Letter may fully understand the Wants or Intentions of the Sender. Of these I shall give sundry Examples.

A Letter from a Son to his Father.

Hon. Father,

AS I have not had a Letter from you since your Favour of the 8th of *October* last, which I answered by the next Post, I take this Opportunity of enquiring after your Health, and that of my Sister. Pray give my Love to my Sister, and be pleased to accept of my Duty to yourself, who am, *Sir,*

London, Dec. 6, *your most dutiful Son,*
1801. Anthony Addlehill.

The Answer.

Dear Son, *Pemsey, 28th Dec.* 1804.

I Received the Letter of the 6th Instant, and thank you for enquiring after my Health, which, I thank GOD, I perfectly enjoy at present, as I wish and hope you do. Your Sister sends her Love to you, and with it a Turkey and a Chine of Bacon, to which I wish you and your Friends (if you invite any) a good Appetite. Prayers to God for your Prosperity, temporal and eternal, are constantly offered up by

Your loving Father,
Andrew Addlehill.

A Letter from a Niece to her Aunt.

Dear Aunt,

THE Trouble I have already given you puts me to the Blush, when I think of intruding again on your Goodness; but Necessity, which frequently obliges us to such Actions as are contrary to our Inclination, is the Motive that induces me to be thus troublesome now. Pray excuse me, if I once more beg your Assistance, which I do not doubt but you very well know I stand greatly in Need of at this Time; and I shall ever have a grateful Remembrance of your Goodness to me; and I hope I shall be, one Time or other, in a Capacity of making some Return for the many Obligations your Goodness hath conferred upon me.

London, May 6,
1805.

Your most affectionate Niece,
and very humble Servant,
Penelope Pinch.

A Brother to a Sister.

Dear Sister,

MY great Distance and long Absence from you makes me very solicitous concerning your Welfare: Natural Affection inclines me strongly to have you in Remembrance, tendering your Health and Welfare in every Respect, as dear as my own; and there is nothing at my Command, but, if you request, it shall be freely yours. Notwithstanding the Distance, I purpose to make you a Visit very shortly, and I had done it before now, but an urgent Occasion interposed, the Particulars of which being too long for a Letter, I shall acquaint you with when I see you. Pray give my due Respects to all Friends, and I am,

Dear Sister,
London, May 6, 1805.
Your Affectionate-Brother,
Henry Hearty.

A Letter from a Youth at School to his Parents.

Honoured Father and Mother,

I AM very much obliged to you for all your Favours; all I have to hope is, that the Progress I make in my Learning will be no disagreeable Return for the same. Gratitude, Duty, and a View to future Advantages, all conspire to make me fully sensible how much I ought to labour for my own Improvement, and your Satisfaction, in order to shew myself upon all Occasions, to be

Acton School, May 8. 1805.
Your most obedient Son,
Daniel Diligent.

A Letter of Recommendation.

SIR,

THE Bearer, *Francis Faithful,* I send to you as one whose Honesty you may rely on; and my Experience of his Conduct and Fidelity gives me a certain Kind of Confidence in recommending him to you; for you know, Sir, that I would not recommend any one to you, of whose Probity I had the least Shadow of Doubt or Suspicion. I am, with due Respect,

Sir, your real Friend,
May 6, 1805.
and humble Servant,
George Generous.

A Letter of Thanks.

SIR,

I RECEIVED your Favour, with the kind Present which accompanied it: I have no other Way of expressing my Gratitude at present, than by my hearty Thanks; every Thing you do has a peculiar excellence, and the Manner of doing it is as agreeable as the Action itself; but I must stop, lest I should offend that Delicacy, which I would commend, and which is constantly admired by,

May 10, 1805.
Sir, your most obliged and
most humble Servant,
George Grateful.

A Letter by Way of Petition to a Friend.

Honoured Sir,

I AM uncertain whether my late Misfortunes have come to your Knowledge; however I will presume on your Good-nature, being assured, from sundry Examples of your Compassion, that you will think of and take Pity on the Distressed; therefore, as an Object truly deserving Compassion, I most humbly implore and petition you to consider the many Losses and Disappointments that I have lately met with, which have reduced me to such necessitous Circumstances, that I cannot possibly proceed in my Affairs: You was pleased once to stile me your Friend, and so I was indeed: I doubt not, Sir, but your Generosity and Goodness are great; and I hope, with all Humility, you will be pleased to interpose your good Offices between Ruin and, *Sir,*

Waltham Abbey, *Your very humble Servant,*
April 3, 1805. Laurence Luckless.

It is as proper to know how to subscribe, and how to direct, as it is to write a Letter.

SUPERSCRIPTIONS.

To the King's Most Excellent Majesty.
To the Queen's Most Excellent Majesty, &c.
To the Prince, *To his Royal Highness,* &c.
To the Princess, *To her Royal Highness,* &c.

To Archbishops.

To his Grace the Lord Archbishop of Canterbury; or, *To the most Reverend Father in God,* &c.

To Bishops.

To the Right Reverend Father in God, &c.

To Deacons, Archdeacons, &c.

To the Reverend A. B. *D. D. Dean of* W.

To the Inferior Clergy.

To the Reverend Mr. A. &c. or, *To the Reverend Doctor,* &c.

To the Great Officers of State.

To the Right Honourable A. *Lord L. Lord High Chancellor of* Great Britain.—*Lord President of the Council.*—*Lord Privy Seal.*—*One of his Majesty's principal Secretaries of State,* &c.

To Temporal Lords.

To his Grace the Duke of, &c. *To the most Honorable the Marquis of, &c. To the Right Honorable the Earl of,* &c. *To the Right Hon. the Lord Viscount,* &c. *To the Right Hon. the Lord,* &c.

The eldest Sons of Dukes, Marquisses, and Earls, enjoy by the Courtesy of *England,* the second Title belonging to their Father; thus the eldest Son of a Duke of *Bedford* is called Marquis of *Tavistock;* of the Duke of *Grafton,* Earl of *Euston;* of the Earl of *Macclesfield,* Lord Viscount *Parker,* &c. and their Daughters are called Ladies, with the Addition of their Christian and Surnames thus: Lady *Carolina Russel,* Lady *Augusta Fitzroy,* Lady *Betty Parker,* &c.

The younger Sons of Dukes are in like Manner called Lords: and those of Marquisses and Earls, together with all the Children of Viscounts and Barons, are stiled *Honorable.*

To a Baronet, *Honorable;* To a Knight, *Right Worshipful,* and to an Esquire, *Worshipful.*—Every Privy Counsellor, though not a Nobleman, hath the Title of *Right Honorable.* All Ambassadors have the Style of *Excellency,* as hath also the Lord Lieutenant of *Ireland,* and the Captain General of his Majesty's Forces. The Lord Mayor of *London,* during his Mayoralty, hath the Title of *Right Honorable.* And the Sheriffs, during that Office, have the Title of *Right Worshipful.* All Mayors of Corporations have the Title of *Esquires,* during their Office.

For the Beginning of Letters.

To the King; *Sire,* or *May it please your Majesty.*
To the Queen; *May it please your Majesty.*
To the Prince; *Sir,* or *May it please your Royal Highness.*
To the Princess; *Madam,* or *May it please your Royal Highness.*
To a Duke; *My Lord,* or *May it please your Grace.*
To a Duchess; *Madam,* or *May it please your Grace.*
To an Archbishop; *May it please your Grace.*
To a Marquis; *My Lord,* or *May it please your Lordship.*
To a Marchioness; *Madam,* or *May it please your Ladyship.*
To an Earl, Viscount, or Baron; *My Lord,* or *May it please your Lordship.*
To their Consorts; *Madam,* or *May it please your Ladyship.*

To a Bishop; *My Lord,* or *May it please your Lordship.*
To a Knight; *Sir,* or *May it please your Worship.*
To his Lady; *Madam,* or *May it please your Ladyship.*
To a Mayor, Justice of Peace, Esquire, *&c.* *Sir,* or *May it please your Worship.*
To the Clergy; *Reverend Sir; Mr. Dean; Mr. Archdeacon; Sir,* &c. as Circumstances may require.

At subscribing your Name, conclude with the same Title you began with; as, *my Lord, your Lordships,* &c.

To either House of Parliament, and to Commissioners, Bodies corporate;

To the Right Honourable the Lords Spiritual and Temporal in Parliament assembled.

To the Honourable the Knights, Citizens, and Burgesses, in Parliament assembled.

To the Right Honourable the Lords Commissioners of the Treasury *or* Admiralty.

To the Honourable, the Commissioners of his Majesty's Customs; Revenue of the Excise, &c.

To the Right Worshipful the Governors of Christ's Hospital.

To the Master, Wardens, and Court of Assistants of the Worshipful Company of Stationers.

Of Secret Writing.

First, If you dip your Pen in the Juice of a Lemon, or of an Onion, or in your own Urine, and write on clean Paper whatever you intend, it will not be discerned till you hold it to the Fire, and then it will appear legible.

Another Way; when you write a Letter the Contents of which you intend shall not be discovered, but by those you think fit; first write your Thoughts on one Side of your Letter with black Ink, as usual, and then, on the contrary Side go over the said Matter that you would have secret, with a clean Pen dipped in Milk, and that Writing cannot be read without holding it to the Fire, when it will appear *legible* in a bluish Colour.

A third Method is, to have two Pieces of Paper equal in size, and the uppermost Cut in chequered Holes or Squares big enough to contain any Word of six or seven Syllables, and in those Squares write your Mind in regular sense; and then take off the said chequered Paper, and fill up the Vacancies with Words of any Kind, which will render it perfect Nonsense, and not capable of being read to any Purpose. And transmit and send the said uppermost, or checquered Paper, or another exactly of the same Form to your Correspondent; whereby he shall, by laying it nicely on your said Letter, read your intended Sense, without being perplexed with the Words of Amusement, intermixed, which make it altogether unintelligible

Or again, you may write to your Friend in proper Sense with common Ink, and let the Lines be at so commodious a Distance, that what you intend to be secret may be written between them with Water, in which Galls have been steeped a little Time, but not long enough to tincture the Water; and when Dry, nothing of the Writing between the said Lines can be seen; but when it is to be Read, you must with a fine Hair Pencil dipped in Copperas-water go between the said Lines, and so you make it legible.

Note. This way will excite no Suspicion, because the Letter seems to carry proper Sense in those lines that are set at a proper Distance.

Of ARITHMETIC.

AFTER Writing, the next necessary Step towards qualifying a Person for Business, is the understanding the noble Science of *Arithmetic*, a Knowledge so necessary in all the Parts of Life and Business, that scarce any Thing is done without it.

In my Directions for its Attainment I shall proceed with such Plainness of Method, and Familiarity of Stile, as shall render it easy to be understood and conspicuous to the meanest Capacity.

And first of *Notation* and *Numeration*.

In *Notation* we must note, or observe, that all Numbers are expressed by, or composed of, these ten Figures, or Characters following, *viz.*

One,	*Two,*	*Three,*	*Four,*	*Five,*	*Six,*	*Seven,*	*Eight,*	*Nine,*	*Cypher.*
1	2	3	4	5	6	7	8	9	0

Nine of these are called significant Figures, to distinguish them from the *Cypher*, which of itself signifies nothing: but as it is placed in whole Numbers, serves to increase the Value of the next Figure or Figures that stand before it; as

3 is but three; but before the Cypher, thus, 30, the 3 becomes thirty, &c.—But in Decimal Fractions 0 decreases the Value of Figures behind it, for there, 3 is three-tenths of any Thing; but by placing 0 before it, thus, 03, it is decreased from 3 tenth Parts to 3 hundreth Parts of any thing, &c. We are to observe, That every one, or any of the above-mentioned nine Figures, or Digits, have two Values; one certain, and another uncertain; the certain Value is when it stands alone by itself; the uncertain is, when joined or placed with other Figures or Cyphers: for when any one of these Figures stand alone, they signify no more than their own simple Value; as 5 is but five, 4 but four, 6 but six, and 3 no more than three, *&c.* And this is the certain Value of a Figure: But when another Figure or Cypher is annexed, they then are increased in their Value ten Times; as 5, or 5 Units or Ones, to 5 tens, or fifty; 4 to 4 tens, or forty; 6 to 6 tens, or sixty; and 3 to 3 tens, or thirty; as thus, 51, fifty-one; 42, forty-two; 63, sixty-three; 34, thirty-four, *&c.* Again, if any of the said Figures stand in the third Place towards the left-hand, they signify so many Hundreds as they expressed Units or Ones; as 500, is five Hundreds, 400, four Hundreds, 600, six Hundreds, and 300, three Hundreds, *&c.* If any of them possess the 4th Place towards the left-hand, they are so many Thousands as they contain Units: and so any or every Figure increases by a ten-fold Proportion, from the right-hand to the left, according to the Place it is found or stands in; so that 5 may be either five or fifty; five Hundred, or five Thousand; in the first Place, 5; in the second, 50; in the third, 500; in the fourth Place, 5000, *&c.* The true Value of Figures in Conjunction may be fully learnt and understood by the following Table.

The

The Numeration Table.

12 C Thous. of M.	11 X Thous. of M.	10 Thous. of M.	9 C of Millions.	8 Tens of Millions.	7 Millions.	6 C of Thousands.	5 Tens of Thousands.	4 Thousands.	3 Hundreds.	2 Tens.	1 Units.	Thous. of Millions.	Millions.	Thousands.	Units or Ones
1	2	3	4	5	6	7	8	9	0	1	2	123	456	789	012
	1	2	3	4	5	6	7	8	9	0	1	12	345	678	901
		1	2	3	4	5	6	7	8	9	0	1	234	567	890
			1	2	3	4	5	6	7	8	9		123	456	789
				1	2	3	4	5	6	7	8		12	345	678
					1	2	3	4	5	6	7		1	234	567
						1	2	3	4	5	6			123	456
							1	2	3	4	5			12	345
								1	2	3	4			1	234
									1	2	3				123
										1	2				12
											1				1

For the easier Reading of any Number, first get the Words at the Head of the Table by Heart; as Units, Tens, Hundreds, Thousands, &c. and apply them thus; 75. five Units, Five; and 7 Tens, Seventy; that is, Seventy-five. Again, 678; 8 Units, Eight; 7 Tens, Seventy; and 6 Hundreds, six Hundred; that is six Hundred Seventy-eight. Once more, 3456; Units, six; 5 Tens, Fifty; 4 Hundreds, four Hundreds; 3 Thousands, three Thousands; together, three Thousand, four Hundred Fifty six. The 4th Line of the Table, *viz.* 123456789, may be read thus: One Hundred twenty-three Millions, four Hundred Fifty-six Thousand, seven Hundred Eighty-nine. But the Manner of reading any Number may be rendered more intelligible by Stops, thus; make a Comma after every third Figure or Cypher, beginning at the Right-hand, and so on towards the Left, thereby distinguishing every third Place into Hundreds, as Hundreds of Units, Hundreds of Thousands, Hundreds of Millions, and Hundred Thousands of Millions, &c. And for Trial, read the first Line of the Table; where the last Place in Valuations is Hundred-Thousand of Millions, and being pointed into Periods, will stand thus, 123,456,789,012, and is to be read thus, One Hundred, twenty-three Thousand, four Hundred fifty-six Millions, seven Hundred eighty-nine Thousands (no Hundreds) and Twelve. Again, the following Number, *viz.* 276,245,678,921,460, is to be read thus; 276 Million of Millions, 245 Thousands of Millions, 678 Millions, 921 Thousands, 460 Units or Ones; that is, two Hundred and seventy-six Millions of Millions, two Hundred forty-five Thousand six Hundred seventy-eight Millions, nine Hundred twenty-one Thousands four Hundred and Sixty. The foregoing *Table of Numeration* is on the Right-hand distinguished into such periods, for the easier reading thereof; and the like is frequently done in the Public-Offices, and by Men of Business.

Numbers to be read or written, *viz.*

96, *Ninety-six.*
242, *Two hundred forty-two.*
7924, *Seven thousand* 9 *hundred* 24.
54006, *Fifty-four thousand and six.*
524707, *Five hundred* 24 *thousand* 707.
4706240, *Four millions* 706 *thousand* 240.
62700472, *Sixty-two millions* 700 *thousand* 472.
474960204, *Four hundred* 74 *millions* 960 *thousand* 204.
4214007042, *Four thousand* 214 *millions* 7 *thousand* 42.
44214800240, *Forty-four thousand* 214 *millions* 8 *hundred thousand* 240.

Of Numerical Letters.

Numbers were anciently expressed by Letters: and it is necessary to understand them, for the readier reading the dates to years, frequently used in the Title-pages of books, on Funeral Monuments, in Roman History, &c.

I *signifies One,*
V *Five,*
X *Ten,*
L *Fifty,*
C *An Hundred,*

CC *Two Hundred,*
D or IↃ *Five Hundred,*
M or CIↃ *A Thousand,*
IↃↃ *Five Thousand,*
CCIↃↃ *Ten Thousand,*

IↃↃↃ

IƆƆƆ *Fifty Thousand,*

CCCCIƆƆƆƆ *A Hundred Thousand,*

IƆƆƆƆ *Five Hundred Thousand,*

CCCCCIƆƆƆƆƆ *Ten Hundred Thousand or a Million,*

M.DCCCV *expresses the present date of* 1805.

M. *being one Thousand,* D. *five Hundred,* CCC *three Hundred and* V. *Five; together, one Thousand, eight Hundred and Five.*

When a Letter of inferior Value stands after one of superior, its Value is to be added thereto; thus VI, VII, and VIII, signify six, seven, and eight; but when a Letter of inferior Value is placed before one of superior, then its Value is to be taken therefrom, thus IV, IX, XL, and XC, signify four, nine, forty, and ninety.

ADDITION,

IS the putting together two or more Numbers or Sums, so as their total Value may be discovered or known.

Herein we must always observe to set the Numbers, to be added, orderly one under the other; that is, Units under Units, Tens under Tens, Hundreds under Hundreds, *&c.* as in the subsequent Examples.

Addition of Numbers of one Denomination.

Yards.

	T.	U.
	2	4
	4	2
	6	8
	8	6
	2	4
	4	2
2	8	6

Gallons.

	H.	T	U.
	7	5	6
	4	3	2
	5	7	8
	6	9	6
	4	2	2
	6	7	8
3	5	6	2

Pounds.

	X. of Th.	Th.	H.	T.	U.
	5	7	9	6	2
	3	9	7	4	4
	6	7	2	2	2
	7	9	6	7	4
	5	2	4	9	2
	7	2	3	9	0
3	6	9	4	8	4

In Addition of simple Numbers, whether it be *Yards, Gallons, Pounds,* or any thing else, remember to carry 1 for every 10 that you find in the Right-hand Row, or Rank of Figures, being units to the next Row of Tens; and the like from the Rank of Tens to the Row of Hundreds, *&c.* and whatever it makes in the last Row, you must set down, amount to what it will.

The numbers above are set down in Order, as before directed; that is, Units under Units, Tens under Tens, &c. as may be plainly understood, by being indicated at the Head of each Row, or Rank, by U. T. H. &c. signifying Units, Tens, Hundreds, &c. Then in casting up each Example to know its Total, I begin at the Right-hand, or Unit's Rank of the first Example, and say 2 and 4 is 6, and 6 is 12, and 8 is 20, and 2 is 22, and 4 is 26; in which Row there are two Tens, and 6 over; wherefore I set down 6 just under its own rank, and carry 2 to the next Row, and say 2 that I carry, and 4 makes 6, and 2 is 8, and 8 is 16, and 6 is 22, and 4 is 26, and 2 is 28; and this being the last Row, I set down the Amount, *viz.* 28; so that the total Number of Yards is found to be 286. And the Amount of the next or 2d Example is found by the same Method to be 3562 Gallons. And in the third and last Example, the total Number of Pounds is found by the same Way to be 369484. And so the total of any other Example of the same Kind, *viz.* simple Numbers of one Denomination may be found. *Note,* That when any of the Ranks amount to just 10, 20, 30, 40, 50, &c. then you must set down the 0 under its proper Rank, and carry either 1, 2, 3, 4, or 5, according to the Number of Tens that you find to the next Row.

We come now to *Addition of Money.*

In *England*, or *Great Britain*, Accounts are kept in Pounds, Shillings, Pence, and Parts of a Penny; so you are to observe, that

4 *Farthings* make 1 *Penny*,
12 *Pence* 1 *Shilling*, and
20 *Shillings* 1 *Pound*.

In adding of these together, you are with the same Punctuality to mind, that Pounds be set directly under Pounds, Shillings under Shillings, Pence under Pence, and Farthings under Farthings; as in the following Example.

But before you proceed, it will be necessary to have the following Tables by Heart, for the readier Remembrance of how many Shillings there are in a given Number of Pence, and how many Pounds are contained in a given Number of Shillings, &c.

Note, that *l.* stands for Pounds, *s.* for shillings, *d.* for Pence, and *qr.* for farthing, those being the initial Letters of *Libra, Solidus, Denarius,* and *Quadrans, Latin* Words o the same Signification.

Tables.

Pence	*s.*	*d.*
20 is	1	8
30	2	6
40	3	4
50	4	2
60	5	0
70	5	10
80	6	8
90	7	6
100	3	4
110	9	2
120	10	0

s.	*l.*	*s.*
20 is	1	0
30	1	10
40	2	0
50	2	10
60	3	0
70	3	10
80	4	0
90	4	10
100	5	0
110	5	10
120	6	0

The Use of these Tables is this: whenever you are casting up any Sum of Money you begin at the right-hand (as before in Sums of one Denomination) suppose at the Place of Pence, then if the Rank or Denomination of Pence amounts, from the Bottom to the Top, to 56; your Table of Pence tells you, that 50*d.* is 4*s.* 2*d.* to which adding 6*d.* the Sum is 4*s.* 8*d.* If to 92*d.* the Table tells you, that 90*d.* is 7*s.* 6*d.* which with 2*d.* over, is 7*s.* 8*d.* And if to 81*d.* the Table shews that 80*d.* is 6*s.* 8*d.* and 1*d.* more makes 6*s.* 9*d,* &c.

The *Shilling Table* serves to lead you to a quick Recollection, how many Pounds there are in so many Shillings; as admit the Rank of Shillings arises to 57*s.* the Table says that 50*s.* is 2*l.* 10*s.* and 7*s.* over make 2*l.* 17*s.* If to 84*s.* the Table declares, that 80*s.* are just 4*l.* and 4*s.* over, make 4*l.* 4*s.* If to 112*s.* the Table tells you that 100*s.* are 5*l.* and 12*s.* more make 5*l.* 12*s.* *&c.*

Addition of Money.

Money owing, and Money received as follows:

	(1)	*L.*	*S.*	*D.*
Owe to	Mr. *Andrews*	4	12	6
	Mr. *Bent*	7	6	9
	Mr. *Crawley*	4	12	0
	Mr. *Dupper*	6	17	7
	Mr. *Eaton*	5	6	6
	Mr. *Franklin*	4	12	3
	Mr. *Gregory*	6	0	0
	Mr. *Fisher*	5	15	4
		45	2	11

	(2)	*L.*	*S.*	*D.*
Rec. for	*Tobacco*	46	10	9
	Sugar	79	16	0
	Indigo	42	18	3
	Broad Cloth	66	12	4
	Canary	90	15	0
	Port Wine	84	7	6
	Rice	24	12	0
	Logwood	60	10	0
		496	2	10

I begin with the Right Hand Rank, that is the Pence in the Example of Money owing, and say 4 and 3 is 7, and 6 is 13, and 7 is 20, and 9 is 29, and 6 makes 35 Pence; now 30 Pence, according to the Table is 2*s.* 6*d.* and 5*d*, more make 2*s.* and 11*d.* I set down 11 exactly under the Rank of Pence, and say, 2 Shillings that I carry (which I do to the Rank of Shillings) and 5 is 7, and 2 is 9, (for I take first only the Units Rank of Shillings) and 6 is 15, and 7 makes 22, and 2 is 24, and 6 is 30, and 2 makes 32: and now being come to the Top of the Sum, and it making 32, I come down with the Tens of Shillings, saying 32 and 10 is 42, and 10 is 52, and 10 is 62, and 10 is 72 and 10 makes 82 Shillings; and the Table telling me that 80 Shillings is 4 Pounds, I know therefore 82*s.* is 4*l.* 2*s.* wherefore I set down the odd 2*s.* just under the Row of Shillings, and carry four pounds to the Pounds; saying, 4 that I carry and 5 is 9, and 6 is 15, and 4 is 19, and 5 is 24, and 6 is 30, and 4 is 34, and 7 is 41, and 4 makes 45 Pounds; so that the Total of those several Sums of Money, due to the several Persons, amounts to 45*l.* 2*s.* 11*d.*

In the Example of Money received, I begin at the Right-Hand Rank as before, and say, 6 and 4 is 10, and 3 is 13, and 9 make 22, and 22 Pence being 1*s.* 10*d.* I set down 10 and carry 1*s.* to the Shillings; saying, 1 that I carry and 2 is 3, and 7 is 10, and 6 is 16, and 2 is 18, and 8 is 26, and 6 makes 32; then I come down with the Tens, saying, 32 and 10 make 42, *&c.* and find at the Bottom it comes to 102 Shillings, which make 5*l.* 2*s.* I set down 2*s.* and carry 5*l.* to the Pounds, saying, 5 that I carry and 4 is 9, *&c.* I find that at the Top it amounts to 36, whereof I set down 6 exactly under its own Rank, *viz.* the Rank of Units of Pounds, and carry 3 for the 3 Tens that are in 30, for at all times in the Addition of the Left-hand Denomination, whether it be Money, Weight, or Measure; that is in the Denomination of Pounds, Tons, or Yards, you must for every Ten carry one to the next Row, *&c.* saying, 3 that I carry and 6 is 9, and 2 is 11, and 8 is 19, *&c.* and I find that at the Top it comes to 49; wherefore I set down 49 to the Left-hand of the 6; and the Total Amount of the Money received for those particular Goods or Wares sold is 496*l.* 2*s.* 10*d.*

I recommend the learner to make himself completely

Master of these and the following Examples before he proceed; because if he understand the Addition of Money he will find but little difficulty in the other parts of Compound Addition.

More Examples for Practice.

		l.	s.	d.	l.	s.	d.	l.	s.	d.
Money due from	Mr. *Money*	17	12	6¼	146	12	3½	4	10	6
	Mr. *Gaunt*	26	10	2	287	10	9	0	7	9
	Mr. *Herne*	30	0	0	46	16	6	1	0	0
	Mr. *James*	44	12	8½	100	0	0	1	1	0
	Mr. *King*	60	14	0	72	12	1	0	4	6
	Mr. *Long*	29	16	6¾	69	16	6¾	0	10	0
	Mr *Monk*	16	10	0	460	12	9	4	14	4
	Mr. *Napper*	20	0	0	49	10	0	0	7	6
	Mr. *Oliver*	27	11	4½	7	12	4½	0	1	6
	Mr. *Perkins*	17	4	8	13	10	0	0	2	6
	Mr *Quinton*	20	10	3	164	12	9	3	10	9
	Mr. *Roper*	46	16	0	75	10	6	1	10	0
	Total	377	18	3	1494	16	6¾	18	0	4

Addition of Avoirdupoise Weight.

By this Weight are weighed all Kinds of *Grocery* Goods or Wares, or Goods subject to Waste; as *Tobacco, Sugars, Fruit* and *Drugs*; as also *Flesh, Butter, Cheese, Allum, Tallow, Iron, Brass, Copper, Lead, Tin, Pewter, Pitch, Tar, Rosin, Hemp, Flax, Soap, Salt,* &c.

A Table of this Weight is as follows, *viz.*

4 Quarters make 1 Dram, marked *dr.*
16 Drams 1 Ounce - *oz.*
16 Ounces 1 Pound - *lb.*
28 Pounds 1 quarter of a Hundred Weight - - *qrs.*
4 Quarters 1 Hundred Weight *C.*
20 Hundred Weight 1 Ton *T.*

10 4 28	10 4 28	10 4 28	10 16 16
C. qrs. lb.	*C. qrs. lb.*	*C. qrs. lb.*	*lb. oz. dr.*
5—1—16	24—2—12	9—1—16	24—11—12
4—2—24	42—2— 0	4—3—26	42—14—15
6—3— 6	16—0—12	7—1— 0	64—10—11
7—1—12	25—3—24	5—3—27	29— 9—10
9—0—20	19—0—20	4—3— 2	16—12—13
6—2— 0	26—1—22	2—2— 2	27—13—14
39—3—22	154—3— 6	34—3—17	206—9—11

In these Examples the Manner of proceeding is the same as in the former, observing, that the Number of Units of each lesser Denomination, which make an Unit of the next greater, found by the preceding Table, is placed above each Rank of Numbers; that is to say, in the first Example, 28 the Number of Pounds contained in a Quarter of a Hundred Weight, is placed over the Column of Pounds: now that Column, when added up, makes 78, which contains two 28's, and 22 over, wherefore I set down 22 under the Column of Pounds, and carry 2 to the Column of Quarters, and so on.

Note, That in weighing at the water-side, or elsewhere, they do not weigh by the Ton, though some Goods are sold by it, as *Iron, Logwood, Cheese,* &c. but by the Hundred, Quarters, and Pounds, which are afterwards reduced to and computed by Tons.

Addition of Troy Weight.

By this Weight are weighed *Jewels, Gold, Silver, Pearls* and *Medicines,* and the usual Denominations are *Pounds, Ounces, Penny-weights,* and *Grains,* as in the following Table, *viz.*

24 *Grains make* 1 *Penny-weight.*
20 *Penny-weights* 1 *Ounce,* and
12 *Ounces* 1 *Pound Troy-weight.*

Examples

Examples of Troy-Weight.

6 Ingots of Silv. wt. *viz.*					10	12	20	24	12	20	24
No.	*lb.*	*oz.*	*pw.*	*gr.*	*lb.*	*oz.*	*pw.*	*gr.*	*oz.*	*pw.*	*gr.*
1 Wt.	4	5	12	10	14	6	10	11	201	10	14
2	5	4	16	17	24	10	11	12.	96	7	17
3	3	11	19	20	21	6	4	17	100	11	12
4	4	6	7	12	22	10	12	14	56	16	20
5	5	1	11	12	16	11	12	13	212	10	23
6	4	11	12	13	22	7	6	17	96	19	12
	28	6	0	12	123	4	18	12	767	17	2

If what was before said be duly observed, the Performance of the above Examples will be attended with no Difficulty.

How to prove Addition.

IN all examples of *Addition*, whether of simple Numbers, that is, Numbers of one Denomination; or in Examples compound, that is of divers Denominations, as *Pounds, Shillings, Pence,* and *Farthings,* &c. the readiest Method of Proof is to cast the same downwards (beginning at the Top as you did the same upwards, beginning at the Bottom, and if that Operation produce the same Total, the Work is right. I might here also give several Examples of other Kinds of *Addition,* such as *Apothecaries Weight, Cloth, Liquid, Dry,* and *Long Measure, Time,* &c. but the Method serves for any of them, having respect to the Tables belonging to those several Denominations, which are as follow, *viz.*

A Table of the Parts of Apothecaries Weight.

20	*Grains*	1	*Scruple*	℈	a Scruple.
3	*Scruples*	1	*Dram*	ʒ	a Dram.
8	*Drams*	1	*Ounce*	℥	an Ounce.
12	*Ounces*	1	*Pound*	℔	a Pound.

By these Weights Apothecaries compound their Medicines; but they buy and sell their drugs by *Avoirdupois Weight.*

Note. Physicians make Use of the following Characters.

℞ -	Recipe, take.	gutt.	a Drop.
ana.	of each ingredient an equal quantity.	P	Such a Quantity as may be taken between the Thumb and two fore Fingers.
℔ -	a Pound.	M. -	a Handful.
℥ -	an Ounce.	Cong.	a Gallon.
ʒ -	a Dram.		
℈ -	a Scruple.		
gr. -	a Grain.		

Cochl.

Cochl.	a Spoonful, or half an Ounce of Syrups, or three Drams of Distilled Waters.
Ss. -	Half.
Q. s.	a sufficient Quantity
Q. l.	as much as you please.
S. a.	According to the rules of Art.

Cloth Measure.

4 *Nails*, or 9 *Inches*,	1 *qr. of a Yard.*
4 *qrs.* or 36 *Inches*,	1 *Yard.*
5 *qrs.* or 45 *Inches*,	1 *Ell English.*
3 *qrs.* or 27 *Inches*,	1 *Ell Flemish.*
6 *qrs.* or 54 *Inches*,	1 *Ell French.*

A Table of Wool Weight.

Note, 7*lb.* make 1 *Clove*; 2 *Cloves*, or 14*lb.* 1 *Stone*; 2 *Stones*, or 28*lb.* 1 *Todd*; 6 *Todd* and ½ 1 *Wey* or 182*lb.* 2 *Weys*, or 364*lb.* 1 *Sack*; and 12 *Sacks* 1 *Last*, or 4368*lb.* 240*lb.* 1 *Pack of Wool.*

Note, That 1*lb.* 2*oz.* 12*pw.* *Troy*, is equal to a Pound *Avoirdupois*; and a Pound *Troy* is about 13*oz.* 2 *Drams* and a half *Avoirdupois.*

		l.	*s.*	*d.*
A Pound Weight *Troy*	of Silver is Worth,	3	2	2
A Pound Wt. *Avoirdupois*,		4	15	3

100*l.*	in Gold	weighs	1	11¾	*Avoi. Wt.*
	in Silver		26	04	

A pound *Avoirdupois* is heavier than a Pound *Troy*; but an Ounce *Troy* is heavier than an Ounce *Avoirdupois*: i. e. 144 *lb. Avoirdupois* are equal to 175 Pounds *Troy*; but 175 Ounces *Troy* are equal to 192 Ounces *Avoirdupois.*

A Table of Liquid Measure.

Liquid Measure is of two Sorts, *viz.* one for *Wine, Brandy,* &c. and the other for *Beer* and *Ale.*

Wine, &c.

2 Pints 1 Quart,
4 Quarts 1 Gallon,
42 Gallons 1 Tierce,
63 Gallons 1 Hogshead,
84 Gallons 1 Puncheon,
2 Hogsheads 1 Pipe or Butt,
2 Pipes or Butts 1 Tun, or 252 Gallons.

Sallad Oil hath 236 Gallons to the Tun; but Oil from *Greenland* hath 252 Gallons to the Tun.

Note,

The Wine Gallon contains 231 Cubic or Solid Inches, by which all Liquids are measured, except Beer and Ale.

Beer Measure.

2 Pints 1 Quart,
4 Quarts 1 Gallon,
9 Gallons 1 Firkin,
18 Gallons 1 Kilderkin,
2 Kilderkins 1 Barrel, or 36 Gallons,
1 Barrel and half, or 54 Gallons, 1 Hogshead.

Ale Measure.

2 Pints 1 Quart,
4 Quarts 1 Gallon,
8 Gallons 1 Firkin of Ale, Soap, or Herrings,
2 Firkins 1 Kilderkin,
2 Kilderkins 1 Barrel, or 32 Gallons,
1 Barrel and half, or 48 Gallons 1 Hogshead.

The *Beer* and *Ale* Gallon are the same, viz. 282 solid Inches; but with this Difference, *i. e.* the Barrel of Beer contains 1128 Cubic Inches, or 4 Gallons more than the Barrel of Ale.

Dry Measure.

2 Pints 1 Quart
2 Quarts 1 Pottle
2 Pottles 1 Gallon
2 Gallons 1 Peck
4 Pecks 1 Bushel Land Measure
8 Bushels 1 Quarter
5 Quarters 1 Wey
2 Weys 1 Last
36 Bushels of Sea Coal 1 Chaldron; and 21 Chaldron is accounted a Score in the River *Thames*.

The Chaldron of Coals at London contains 36 heaped Winchester Bushels, and weighs about 28 and a half cwt. according to the Quality of the Coals.

A Newcastle Chaldron weighs 53 cwt. and 8 Chaldrons or 21 Tons 4 cwt. make a Keel. A Ship Load contains 20 Keels, or 160 Chaldrons.

Long Measure.

3 Barley Corns 1 Inch
4 Inches 1 Hand. Used in measuring Horses.
12 Inches 1 Foot
3 Feet 1 Yard
3 Feet 9 Inches 1 Ell Eng.
5 Feet a Geometrical Pace
5 Yards and a Half, 1 Pole, Perch, or Rod
6 Feet 1 Fathom, or 2 Yds.
40 Poles, or 220 Yds. 1 Furlong.
8 Furlongs 1 Mile, or 1760 Yards
3 Miles 1 League.

Land Measure.

144 Square Inches make 1 Square Foot.
9 Square feet 1 Square Yard.
30¼ Yards 1 Square Pole or Perch.
40 Perches 1 Rood or quarter of an Acre.
160 Poles in Length, and 1 in Breadth is 1 Acre.
80 Poles in Length, and 2 in Breadth, 1 Acre.
40 Poles in Length, and 4 in Breadth, 1 Acre.
4 Poles in Length, make 1 Chain, or 22 Yards.
16 Perches 1 Square Chain, and
10 Chains in Length, and 1 in Breadth, make 1 Acre.

Time.

60 Seconds 1 Minute
60 Minutes 1 Hour
24 Hours 1 natural Day
7 Days 1 Week
4 Weeks 1 Month
13 Months, 1 Day and 6 Hours, 1 solar year.

The common Day begins with us, at 12 o'clock at Night: the Astronomical Day begins at 12 o'clock at Noon.

The Solar Year is divided into 12 Calendar Months, which contains 365 Days, according to the following Verse, *viz.*

Thirty Days have September, April, June, *and* November,
February *hath* 28 *alone, and all the rest have Thirty-one.*

Note, Leap Year which happens every fourth Year, consists of 366 Days, on this occasion February contains 29 Days.

SUBTRACTION.

THE next Rule in Arithmetic is *Subtraction*, which teaches to take a lesser Number out of a greater; and sheweth the Remainder or Difference.

Place the lesser Number accurately under the greater, draw a line under them, and beginning at the Right-hand, take each Figure in the lower Line from the Figure under which it stands. If the Figure in the lower Line is greater than that in the upper, then, in Numbers of one Denomination, ten must be borrowed and added to the Figure in the upper Line; take the Figure in the lower Line from the Sum, and write down the Remainder, but for every *ten* thus borrowed, *one* must be paid or added to the next Left-hand Figure in the lower Line. *Example:* suppose Mr. *Andrews* owes to Mr. *Baker* 323*l.* of which Mr. *A* hath paid to Mr. *B.* the sum of 146*l.* in part; what remains due to Mr. *Baker?*

Answer 177*l.*

Here the lesser Number 146 stands under the greater 323; and to find the Remainder, or Sum remaining due, I say 6 from 3 I cannot, but 6 from 13 (for I borrow 10 and add it to the Figure that stands directly over the Figure 6) and there remains 7; then 1 that I borrowed and 4 is 5, for as I borrowed 10 in the inferior Place, which is equal to *one* in the superior, so I must now pay the same; therefore I say, 5 from 2 I cannot, but 5 from 12 (borrowing 10, and adding it to the Figure 2, as above directed) and there remain 7; then 1 that I borrowed and 1 are 2, from 3, the Figure above it, and there remains 1, and so the Example is done; and by it is shewn that Mr. *A.* still owes Mr. *B.* 177 Pounds; for a Proof of its Truth, add 177 the Remainder, to 146, the lesser of the two given Numbers, and it will make 323, being the same with the greater Numbe or Sum of Money first due; and therefore it is a sure Proo of the Truth and Certainty of the Rule.

All Examples in *Subtraction* of Numbers of *one* Denomination are performed as above; but, for the better Explanation, admit a great Sheep Master has in all 6904 Sheep and takes out of them 2490 to dispose of at Market, how many doth he leave behind? To know this set them down thus:

From—6904 the greater Number,
Take—2490 the lesser Number,

Answer 4414

Here I say 0 from 4, and there remains 4; then 9 fro nothing (or 0) I cannot; but 9 from 10 (adding 10 to the 0 and there remains 1; and 1 that I borrowed and 4 make 5 and 5 from 9, and there remain 4; and lastly, 2 from 6, an there remain also 4; so that 4414 are left behind; whic put to the Number he takes to Market, makes the Numbe he had, *viz.* 6904, and shews the Deduction to be true, an the Answer right.

More Examples for Practice.

	Yards.	*Gallons.*	*l.*	*Pounds.*
From	37009	47200	479652	1479672
Take	19765	31976	292949	97694
Rem.	17244	15224	186703	1381978
Proof	37009	47200	479652	1479672

The distance of Time since any Remarkable Event may be found by subtracting the date thereof from the date of the present Year.

Examples.

I.—1805
1666 the fire of *London.*
Since 139 Years.

II.—1805
1588 the *Spanish* Invasion.
Since 217 Years.

III.—1805
1605 Gunpowder Treason.
Since 200 Years.

Subtraction of different Denominations.

Here if the Figure or Figures, placed in the lower Line, exceed those in the upper, then as many Units must be borrowed, as make a Unit, or one, of the next superior Denomination; and one must be carried to the next left hand Place in the lower Line, as before.

	10	20	12
	l.	*s.*	*d.*
Due———	9	2	6
Paid——..	6	16	4
Rests due	2	6	2

Of Money.

Suppose Mr. *Campion* owes Mr. *Darnel* 9*l.* 2*s.* 6*d.* and Mr. *C.* hath paid Mr. *D.* in part 6*l.* 16*s.* 4*d.* what remains due to Mr. *Darnell?* Answer, there is due to Mr. *Darnell* 2*l.* 6*s.* 2*d.*

	l.	*s.*	*d.*
Sold for	242	16	3¾
Paid in Part.	174	12	6½
Answer	68	3	9¼
Proof	242	16	3¾

Again Mr. *Edwards* sells to Mr. *Francis*, *Spanish* Wool to the Value of 242*l.* 16*s.* 3*d*¾, and pays present money the Sum of 174*l.* 12*s.* 6*d*½. What Money remains unpaid from Mr. *Francis?* Answer, 68*l.* 3*s.* 9*d*¼.

In the first of these Examples I say 4*d.* from 6*d.* and there remains 2*d.* then 16*s.* from 2*s.* I cannot, but borrowing one Integer of the next Denomination, or 1 Pound which is 20*s.* I say 16 from 20, and there remains 4, and adding thereto the Number 2 it makes 6; wherefore I put down 6 in the Place of Shillings, and say, 1 that I borrowed and 6 is 7; now 7*l.* from 9*l.* there remains 2*l.* so the Money due to Mr. *Darnell* is 2*l.* 6*s.* 2*d.* as in the Example.

In the second Example, I say 2 Farthings (or an Half-penny) from 3 Farthings, and there remains 1 or ¼, which I set down in its proper Place, *viz.* under the Denomination of Farthings; then 6 from 3 I cannot, but 6 from 12 because 12 Pence make a Shilling, and there remains 6, and 3*d.* over it, makes 9*d.* which I place under the Line in its right place, *viz.* of Pence; then 1 that I borrowed (that is 1 Shilling) and 12 is 13; 13*s.* from 16*s.* and there remain 3, which I likewise set down under its own Rank; then from 2 I cannot, but 4 from 12, (borrowing 10) and there remains 8; then 1 that I borrow and 7 makes 8; 8 from 4 I cannot, but 8 from 14, and there remains 6; so that the Sum remaining due is 68*l* 3*s.* 9*d*¼, as in the Work. For its proof, you must add the Remainder 68*l.* 3*s.* 9*d*¼. to the lesser, or under Sum, 174*l.* 12*s.* 6*d*½, and it makes 242*l* 16*s.* 3*d*¾, the Sum first due, and is a Proof of the Work' being right.

More Examples for Practice.

	l.	*s.*	*d.*	*l.*	*s.*	*d.*	*l.*	*s.*	
Due	174	16	6¼	74	10	4	2471	7	0
Paid	97	12	4¾	29	12	9	1976	16	6
Remain	77	4	1½	44	17	7	494	10	5
Proof	174	16	6¼	74	10	4	2471	7	0

	l.	s.	d.	l.	s.	d.	l.	s.	d.
1st Due	74	0	0	274	16	6	796	0	0
Paid	46	12	10	197	19	4	279	11	7
Balance	27	7	2	76	17	2	516	8	5
Proof	74	0	0	274	16	6	796	0	0

Sometimes a Sum owing may be paid at several Times; then the several Payments must be added together, and their Total deducted from the Sum first due, as in this and the Examples following.

Owing	266*l.*
Paid at different Times.	20
	15
	30
	90
	17
	24
	60
Paid in all	256 *deduct.*
Remains due	10
Proof	266

	l.	s.	d.
More due	249	12	0
Received at several Times	24	12	6
	9	14	6
	20	0	0
	16	16	6
	22	10	5
	13	12	6
	7	16	4
Received in all	115	2	9
Remains due	134	9	3
Proof	249	12	0

	l.	s.	d.
Received	100	10	0
Paid to several Persons	6	16	0
	10	0	0
	5	12	6
	20	10	0
	7	9	6
	9	8	6
	7	12	6
Paid in all	67	9	0
Remains in the Bag.	33	1	0
	100	10	0

Avoirdupois Weight. (See Table p. 44.*)*

	10	20	4	28	10	4	28	10	16	16
	Tons.	*C.*	*qrs.*	*lb*	*C.*	*qrs.*	*lb.*	*lb.*	*oz.*	*dr.*
From	44	12	1	10	246	2	12	146	2	10
Take	39	14	2	6	164	3	22	97	10	12
Rem.	4	17	3	4	81	2	18	48	7	14
Proof	44	12	1	10	246	2	12	146	2	10

Troy Weight. (See Table p. 45.*)*

	10	12	20	24	10	20	24
	lb.	*oz.*	*pwt.*	*gr.*	*oz.*	*pwt.*	*gr.*
From	462	4	10	11	1247	10	13
Take	196	9	6	16	976	16	17
Remain	265	7	3	19	270	13	20
Proof	462	4	10	11	1247	10	13

This Method of Subtraction will serve for any Denomination whatever, having Respect to the several Tables o Quantity, in *Addition*.

MULTIPLICATION.

Multiplication is a compendious Method of performing Addition, and teaches to find what a given Number wil Amount to, when repeated a certain number of Times.

It serves likewise to bring great Denominations into small as Pounds into Shillings, Pence, or Farthings: and having theLength and Breadth of a plain Surface, we find its Contents in superficial or Square Measure.

By *Multiplication* having the Value of one Thing, or the Wages of one Person, we find the Value of many such Things, or the Wages of many such Persons.

In *Multiplication* we are particularly to take Notice o these three Terms, viz. the *Multiplicand*, the *Multiplier* and the *Product*.

1. The *Multiplicand* (generally the greater of the tw Numbers) is the Number to be multiplied.

2. The *Multiplier* is the Number by which the former is t be multiplied.

3. The *Product* is the result or Answer. The *Multiplic* and *Multiplicand* are collectively called *Factors*.

Bu

But before we enter upon this Rule, it is necessary to have the following Table by heart, and that very perfectly.

The Multiplication Table.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

This Table is so plain and easy, that there is scarcely need of Direction; for the Product of any two Figures will be found in that Square, which is on a Line with the one, and under the other; thus 54 the Product of 6 times 9 will be found on a Line with 6, and under 9; or in a Line with 9, and under 6; so 7 Times 8 is 56, and 8 Times 7 is 56, &c. And thus the Table ought to be got by heart for the more dexterous Readiness in multiplying.

Now for Application.

Example 1. How many is 3 Times 472? Which being set down in the Margin; I say, 3 Times 2 is 6, which place under 3 the Multiplier; then 3 Times 7 is 21; set down 1 under 7, and carry 2 for the two Tens, as in *Addition of one Denomination*, then 3 Times 4 is 12, and 2 carried is 14; which set down, and the Product is 1416: that is 3 Times 472 make so much; which may be proved by *Addition*, by setting down 472 three Times in Additional Order, and casting it up, which shews that this Rule performs compendiously the Office of Addition.

472
3
——
1416
——

Example 2. Again, how many are produced by multiplying 742 by 4?

742 *Multiplicand.*
4 *Multiplier.*
——
2968
——

Here I say, 4 Times 2 is 8, and 4 Times 4 is 16; 6 and carry 1; and 4 Times 7 is 28, and 1 is 29, which set down; so the whole Product is 2968, as appears by the Work.

More Examples of one Figure in the *Multiplier* are these, *viz.*

Multiplic.	7420	4444	7460	90704	56789
Multiplier.	5	6	7	8	9
Product.	37100	26664	52220	725632	511101

Compound Multiplication,

Is when the *Multiplier* consists of two, three, or more Figures or Cyphers.

And here you must begin with that Figure which is in the Place of Units of the *Multiplier*, and go through the whole *Multiplicand*, by multiplying each Figure of it first by the said Unit Figure, then by the next, namely, by the Figure in the Place of Tens of the *Multiplier*; then with the third, &c. to the last; always remembering to place the t Figure of every Product or Line exactly and perpen- ularly under the Figure you multiply by; and then add several Lines or Products together, which, so collected, e the total Product required, as in the Examples follow- *viz.*

Example.

Example 1.

How many are 23 Times 7426? First I begin with the Unit Figure 3 in the *Multiplier*, saying 3 Times 6 is 18; 8 (which I set directly under 3, by which I multiply) and carry one; then 3 Times 2 is 6, and 1 is 7; then 3 Times 4 is 12; 2 and carry 1; then 3 Times 7 is 21, and 1 is 22; and so I have done with the first Figure of the *Multiplier, viz.* 3. Then I go to the next, that is 2, and twice 6 is 12; 2 and I carry 1 (which 2 is placed in a direct Line under 2 the multiplying Figure) then twice 2 is 4, and 1 is 5; then twice 4 is 8; and lastly, twice 7 is 14, which I set down; then I add the two Products together, saying 8 is 8, 2 and 7 are 9, *&c.* and the Total is the true Product or Result of the Multiplication, *viz.* 170798. Again

7426
23
22278
14852
170798

Ex. 2. What is the Product of ———— 527527
Multiplied by 285

2637635
4220216
1055054
150345195

It will be prolix, and unnecessary, to give more verbal Directions; and therefore the Learner is referred to the Observations of the Example, as also to those two that follow, *viz.*

527535
15728
4220280
1055070
3692745
2637675
527535
8297070480

275827
19725
1379135
551654
1930789
2482443
275827
5440687575

When Cyphers are intermixed with Figures in the *Mul-iplier*, then multiply the Figures as above; and when you ome to a Cypher in the *Multiplier*, then set down another Cypher exactly and perpendicularly under it, then begin the *Multiplicand* again with the next Figure to the Cypher in the *Multiplier*, and go through it in the same Line, placing the first Figure of that Product next the Cypher, towards the left-hand, but then care must be taken that the next Figure or Cypher of the next Line must be set down one Degree farther towards the left-hand, and not immediately under the last Figure set down to the Cypher; as in the following Examples may be fully understood.

24393	784371	327586
402	23604	6030
48786	3137484	9827580
975720	47062260	19655160
	2353113	
9805986	1568742	1975343580
	18514293084	

When you have a Cypher or Cyphers in the *Multiplier*, at the beginning towards the right-hand, then set it, or them, backwards from the Place of Units towards the right-hand; and when you have multiplied by the Figure or Figures, annex the Cypher or Cyphers.

As in these Examples.

4762	47962	4632
70	400	2600
333340	19184800	27792
		9264
		12043200

If you have Cyphers both in the *Multiplicand* and *Multiplier*, then neglect the Cyphers in both, and multiply by the Figures, and annex the Cyphers at last;

As in these Examples.

42600	42300	376400
220	12000	2400
852	846	15056
852	423	7528
9372000	507600000	903360000

When you are to multiply by 10, 100, 1000, or 10,000, it is only adding or annexing so many Cyphers to the *Multiplicand*, that is, either 1, 2, 3, or 4 Cyphers, and the Work is done. *Example.* Suppose I am to multiply 375 by the Numbers above; if I multiply it by 10, then I join 0 to 375, and it makes, or the Product is, 3750; if by 100, then I annex 00, and it makes 37500; if by 1000, I put to it 000, and it produces 375000; and lastly, if by 10,000 I then add 0000, and it makes 3750000, *&c.* And thus may any Number be multiplied when the *Multiplier* consists of a Unit with any Number of Cyphers, and done by inspection only, without any formal setting down the *Multiplicand* with a Line drawn under it, *&c.*

Our next Business will be to shew the Uses of *Multiplication* in real Life, and how to apply it on proper Occasions, *viz.*

1. Suppose you want to know how many Half Crowns there are in 246*l.* you know that 8 Half-Crowns make 1*l.* wherefore set them down thus:

246*l.*
Multiply by 8
Answer 1968

Again, in 1968 Half-Crowns, how many Pence?
30
59040

And this serves to shew, that great Denominations are brought into smaller by this Rule, according to the Definition. p. 54.

2. Admit that you wanted to know the square Contents of a large Table, 34 Feet long, and 4 Feet wide, multiply 34 the Length by 4 the Breadth, and the Answer will be 136 square Feet for the true Contents of such a Table. And this agrees with another Definition of this Rule.

3. If I know the Value of a Yard of Broad-cloth to be 12 Shillings, what is the Value of 220 Yards of the said Cloth in Shillings?

```
               220
Multiply by-    12
              ----
               440
              220
              ----
              2640 Shillings, or 132 Pounds.
```

If the Wages of 1 Seaman be 23 Shillings a Month, what is the Wages of 250 Seamen for the same Time?

```
Multiply by       23
                 ----
                  750
                 500
                 ----
Answer    5750 Shillings, or 287l. 10s.
```

And these two Examples accord with the other Definition, or Use of this Rule.

I shall, in the next Place, say something concerning *Multiplication of Money*, and a little of its Use, and so conclude this Rule.

Multiplication of Money.

Multiplication of Money has a great Affinity to *Addition of Money;* the same Method being taken in carrying from one Denomination to the next, *viz.* from Farthings to Pence, from Pence to Shillings, and from Shillings to Pounds. And as in *Addition,* and other *Multiplications,* you begin at the Right-hand, and proceed towards the Left, so here you begin at the least Denomination, which is also at the Right-hand.

This Method of accompting is the most apt and expeditious of all others, for small Quantities, and therefore extremely necessary in making Bills of Parcels, *&c.* and is, beyond all Contradiction, as sure and certain as any Way whatsoever.

The General Rule,

Is always to multiply the Price by the Quantity.

The first Step is, for Quantities from 2 to 12; and this is done by one Multiplier, as in the Examples following.

Example 1.

```
                                                     l   s.  d.
Multiply ——————————————————————————————————————————  7   12   6
(or 6 Pieces of Cloth at 7l. 12s. 6d. per Piece) by            6
                                                    -----------
                                                    45   15   0
```

Here I say 6 Times 6 is 36 Pence, which is just 3*s.* I set down 0 in the Place of Pence, and carry 3*s.* to the Place of Shillings, (exactly the same as in *Addition of Money*) then 6 Times 12 is 72, and 3 is 75*s.* or 3*l.* 15*s.* wherefore I set down 15 in the Place of Shillings, and carry three to the Pounds; then 6 Times 7 is 42, and 3 is 45*l.* So the whole Amount of the Pieces of Cloth, at 7*l.* 12*s.* 6*d.* *per* Piece, is 45*l.* 15*s.*

Example 2.

Again, How much is 9 Times 13*s.* 4*d.* or what is the Amount of 9 Marks

In this Example I say, 9 Times 4 is 36*d.* or 3*s.* I set down 0, and carry 3; then 9 Times 13 is 117, and 3 makes 120; but 120 Shillings make just 6*l.* and so much is the Value of 9 Marks.

9
6 0 0

Example 3.

Once more: What is the Value of 12 Gallons of Wine at 5*s.* 4*d.* *per* Gallon?

Here I say 12 Times 4 is 48; 0 and carry 4; then 12 Times 5 is 60, and 4 is 64*s.* or 3*l.* 4*s.* &c.

s. *d.*
5 4
12
l. 3 4 0

The next Degree of Reckoning is of Quantities exceeding 12, even to 12 Times 12, or 144; all which, as far as 144, are found in the *Table of Multiplication*; which is a ready Help to all Purposes of Reckoning; and that you may proceed with Dexterity, you must be very ready in the said Table, that you may immediately see what component Parts suit the Quantity proposed, or is pretty near it, and then work accordingly.

If the Quantity be 15 Yards, I readily know that 3 Times 5 is 15; and therefore 3 and 5, or 5 and 3, are to be my Multipliers: If the Quantity were 21, then 3 and 7, or 7 and 3, would be Multipliers; if 30, then 5 and 6, or 6 and 5; also 3 and 10, or 10 and 3; if 45, 48, 56, 66, 72, 96, &c. were the Quantities, then 5 and 9, 6 and 8, 7 and 8, 6 and 11, 6 and 12, and 8 and 12, &c. are to be my Multipliers, and exactly hit the several Quantities of which they are component Parts; and Examples of this Kind have two Multiplications for their Solution.

I shall now shew some Examples of Regular Quantities that exceed 12, and are precisely answered at two Multiplications, such as mentioned above, *viz.*

What comes 15 Yards of Muslin to, at per Yard?

	s.	d.
	3	5
		3
	10	3
		5
2	11	3

Here 3 Times 5 is 15*d.* or 1*s.* and 3*d.* 3 and carry 1*s.* then 3 Times 3 is 9, and 1 is 10*s.* so the first Product is 10*s.* and 3*d.* which multiply by 5, saying, 5 Times 3 is 15*d.* or 1*s.* and 3*d.* 3 and carry 1; then 5 Times 10 is 50, and 1 is 51*s*, or 2*l.* 11*s.* So the Amount of 15 Yards, at 3*s.* 5*d.* *per* Yard, is 2*l.* 11*s.* 3*d.* And demonstrable thus, *viz.* If 10*s.* 3*d.* be the Value of 3 Times 3*s.* and 5*d.* then 5 Times the Value of 10*s.* 3*d.* must of necessity be 15 Times the Value of 3*s.* 5*d.* because 5 Times 3 is 15: And its Truth may be proved by *Addition* and *Multiplication*, thus; set down 3*s.* 5*d.* three Times, in Additional Order, and put the three Lines together, and the Total of them multiply by 5, as before, and the Answer will be the same. Or set down 17*s.* 1*d.* (the Product of 3*s.* 5d. multiplied by 5) three Times also, and add them together, and the Total will be exactly the same with the Result of Multiplication; as in the following Specimens of Work.

(1)	(2)	(3)
s. *d.*	*s.* *d.*	*s.* *d.*
3—5	3—5	17—1
3—5	5	17—1
3—5		17—1
	17—1	
10—3		2—11—3
5		
2—11—3		

Here the first of these two Proofs is worked by *Addition* and *Multiplication*, and the second by *Multiplication* and *Addition*. Also,

By this we see, that in all Examples under this Head, we are to pitch on two Numbers (for *Multipliers*) in the Table; which multiplied together, make the Quantity proposed; and then we are to multiply the Price by one of the Numbers (it matters not by which first) and then that Product is to be multiplied by the other Number, and the second or last Product will be the Answer.

Example 2.

Again, what is the Value of 21 Gallons of Brandy?

s. d.
at 7—9 *per Gallon.*
7 and 3.
2—14—3
3
8— 2—9

In this Example I say, 9 Times 7 is 63*d.* or 5*s.* 3*d.* I set down 3 and carry 5; then 7 Times 7 is 49, and 5 is 54*s.* or 2*l.* 14*s.* So the first Product is 2*l.* 14*s.* 3*d.* which I multiply by 3, and that produces the last Product or Answer, *viz.* 8*l.* 2*s.* 9*d.*

Now follow a few more Examples of this Sort, without any verbal Directions, because I think those already given to be sufficient.

Example 3.

What is the Value of 30 Ells Holland
s. d.
at 3 7 *per Ell.*
10 and 3
1 15 10
3
Ans. 5 7 6

Example 4.

45 Pounds of Raw Silk,
at 15*s.* 6*d. per lb.*
5 and 9
3 17 6
9
Ans. 34 17 6

Example 5.

56 Bushels of Wheat,
s. d.
at 4 9
7 and 8
1 13 3
8
Ans. 13 6 0

Example 6.

72 Broad-Pieces s. d.
at 13 6 *each.*
12 and 6
14 2 0
6
84 12 0

Example 7.
108 *lb.* of Indigo Lahore
at 7*s.* 8*d.*
9 and 12

3 9 0
12

Ans. 41 8 0

Example 8.
81 *lb.* of Tea.
s. *d.*
at 7 9
9 and 9

3 9 9
9

Ans. 31 7 9

Example 8.

l. *s.* *d.*
96 C. of Currants, at ———— 2 13 6 *per* C.
8 and 12

21 8 0
12

Answer 256 16 0

The next Step is of Quantities, or Numbers that are not to be answered precisely at two *Multiplications:* In this Case you will have an Addition of one Line more, occasioned by bringing down the Price of one to be added to the last Product; or else a Line more made by multiplying the Price by what is defective or wanting in the Number by two Multiplications, to make up the proposed Quantity compleat; as it may be of 2, 3, 4, 5, *&c.* as by the subsequent Examples may be seen and understood.

Example 1. What is the Product of 2*l.* 13*s.* 6*d.* multiplied by 39?

l. 2 13 6
6 and 6

16 1 0
6

96 6 0
8 0 6

104 6 6

Here I find that 6 multiplied by 6, makes 36; which is within 3 of the Quantity proposed; wherefore I multiply by 6, and that Product again by the other 6; the last Product is 96*l.* 6*s.* which is the Value of 36; but we want to know the Value of 39, wherefore I multiply the Price of one, *viz.* 2*l.* 13*s.* 6*d.* by 3 to make up 36 to 39, saying 3 Times 6 is 18*d*, *&c.* And finding that 3 Times 2*l.* 13*s.* 6*d.* is 8*l.* 0*s.* 6*d.* which added to 96*l.* 6*s.* 0*d.* the Total gives the complete Value of 39; for 36 and 3 make 39. See the Work.

Example 2. What comes 79 Cwt. of Cheese to at 28*s.* *per* Cwt.

l.	*s.*	*d.*	
1	8	0	
		7	and 11
9	16	0	
		11	
107	16	0	
2	16	0	
110	12	0	*Ans.*

In this Example I say, 7 Times 0 is 0; then 7 Times 8 is 56; which is 2*l.* 16*s.* set down 16 and carry 2, then 7 Times 1 is 7, and 2 carried make 9. So the first Product is 9*l.* 16*s.* 0*d.* which multiplied by 11, produces, 107*l.* 16*s.* 0*d.* or the Value of 77 Cwt. then for the 2 wanting I multiply the Price by it, and that gives 2*l.* 16*s.* 0*d.* which added to 107*l.* 16*s.* 0*d.* makes the whole Value of 79, *viz.* 110*l.* 12*s.* 0*d.* as in the Work.

Example 3. 112 Pounds of Sugar at 5½ *per lb.* set down thus:

	s.	*d.*	
		5½	*per* Pound.
		10	and 10
	4	7	
		10	
2	5	10	
	5	6	the Product of 5½ by 12 defective.
2	11	4	the Answer.

Here, after I have multiplied by 10 and 10, the Parts of 100, there wants 12; wherefore I multiplied 5½*d.* by 12; and it gives 5*s.* 6*d.* for 12*lb.* at 5½*d.* which added to 2*l.* 5*s.* 10*d.* the Value of 100, makes 2*l.* 11*s.* 4*d.* the true Value of 112*lb.* at 5½*d.* *per* Pound.

Ex. 4. 94 Stone of Beef at 22*d*, or 1*s*. 10*d*. *per* Stone.

	1*s*.	10*d*.
		10 and 9
	18	4
		9
8	5	0
	7	4
8	12	4 *Answer*.

Here what is wanting after the two Multiplications, is 4; wherefore I multiply 1*s*. 10*d*. (the Price) by 4, which produces 7*s*. 4*d*. to be added, &c.

Ex. 5. 97 cwt ½ *Raisins*,

	l.	*s.*	*d.*
at	1	5	6 *per Cwt.*
			9 and 10
	11	9	6
			10
	114	15	0
	8	18	6
		12	9 for the ½ *Cwt.*
	124	6	3

After I have multiplied by 9 and 10, I multiply the Price 25*s*. 6*d*. by the Quantity wanting, and it produces 8*l*. 18*s*. 6*d*. then for the half C. I take half of the Price, which is 12*s*. 9*d*. and then collect the three Lines, the Total of which is 124*l*. 6*s*. 3*d*. for the Answer.

From the last Example it may be observed, that there is no need of much Solicitude, about coming so very near by two Multiplications, for there 7 is wanting to make up the true Quantity; nay, if the two Multiplications be short by 10 or 11, it is near enough; for it is as easy to multiply the Price by 10 or 11, as by 2 or 3, and the Addition is the same.

Exampl

Example 6. Once more; what comes 110 Cwt. $\frac{3}{4}$ of Hops to, at 4*l.* 10*s.* *per* Cwt.

l.	*s.*	*d.*	
4	10	6	
		10.and 10	
45	5	0	
		10	
452	10	0	
45	5	0	
2	5	3	
1	2	7$\frac{1}{2}$	
501	2	10$\frac{1}{2}$	Ans.

After having multiplied by 10 and 10, which makes 100, I multiply the Price 4*l.* 10*s.* 6*d.* by 10. that is wanting, which gives the same with the first Product, *viz.* 45*l.* 5*s.* 0*d.* which stands under the Product by 100; and for the $\frac{3}{4}$ of a Cwt. I take $\frac{3}{4}$ of the Price, *viz.* first the half, and then the half of that half, that is 2*l.* 5*s.* 3*d.* and 1*l.* 2*s.* 7*d*$\frac{1}{2}$; which four Lines added together make 501*l.* 2*s.* 10$\frac{1}{2}$. for the Answer.

To prove Multiplication.

Whether of simple Numbers, or of Money, it is most surely done by *Division;* but before that is known, take this Method, *viz.* As you multiplied the *Multiplicand* by the *Multiplier,* so contrariwise multiply the *Multiplier* by the *Multiplicand;* and if the Products are alike, the Work is right; or otherwise one of them is wrong, and must be gone over again till they do agree.

Example 1.

365 Days in a Year.
24 Hours in a Day.

1460
730

8760 Hours in a Year.

Here (reversely) I say, 5 Times 4 is 20; 0 and carry 2; 6 Times 4 is 24, and 2 is 26; 6 and carry 2; and 3 Times 4 is 12, and 2 is 14. Then 5 Times 2 is 10; 0 and carry 1; 6 Times 2 is 12, and 1 is 13; 3 and carry 1; and 3 Times 2 is 6, and 1 is 7, which Products added together, make 8760, the Hours in a Year, without taking in the odd 6 Hours which the Year doth consist of more than 365 Days.

Example 2.

56 Gallons of Spirits
at s. d.
3 2 *per* Gallon
7 and 8

---

1 2 2
8

---

8 17 4 *Answer.*

I say here, twice 7 is 14; 2 and carry 1s. and 3 Times 7 is 21, and 1 is 22*s.* or 1*l.* 2*s.* Again, twice 8 is sixteen, 4 and carry 1*s.* and twice 8 is sixteen, and 1 is 17, 17 and carry 0; and once 8 is 8*l.* Thus both these Examples are the same in Consequence as if you proceeded in the common and regular Method of *Multiplication*, and shews the Truth of the Operation. The next Rule in order, is

DIVISION.

THIS Rule, though accounted the hardest Lesson in *Arithmetic*, may be made easy and intelligible to the meanest Capacity.

The Use of this Rule is to know how many times one Number or Sum is contained in another; as if it were asked, how often is 9 contained in 54? the Answer is 6 Times; or how many Times 12 is there in 144? Answer 12 Times.

As by *Multiplication* great Denominations are brought into small; so contrarily by *Division*, small Denominations are brought into greater; as Farthings (from one Gradation to another) into Pounds, Pounds Weight into Tons, and Gallons Liquid, into Hogsheads, &c.

In this Rule we are to take particular Notice of the three following Terms, viz

1 The *Dividend*, or Number to be divided.
2 The *Divisor*, or Number by which we divide.
3 The *Quotient* or Answer to the Work; which shews how often the Divisor is contained in the Dividend.

4. The *Remainder*; which is an uncertain Branch of this Rule, because there is sometimes a Remainder, and sometimes not. The *Remainder* is always of the same Name with the *Dividend*, and is less than the *Divisor*, for if it be greater than, or equal to the *Divisor*, the Work is wrong.

To divide any Number of one Denomination by a Number not exceeding 12.

Rule.—Write the Divisor on the Left-hand Side of the Dividend, making a curve Line) between them, and find how many Times it is contained in a certain Number of Figures of the Dividend, and place the Result below.

Multiply the Divisor by the Quotient Figure, subtract the Product from that Part of the Dividend, and carry the Remainder, if any, as so many *Tens* to the next Figure of the Dividend.

Then find how many Times the Divisor is contained in that Number; place the Result in the Quotient, multiply the Divisor, subtract the Product, and carry the Remainder, as so many *Tens*, to the subsequent Figure of the Dividend. Divide again this Number, as before, and so on, to the end of the Dividend.

If the Divisor consist of a Number not greater than 12, and the Dividend of a Number not higher than 144, the Answer is gained at once by the Multiplication Table; thus if 63 is to be divided by 9; the Answer will be 7 Times. Here 63 is the Dividend, 9 the Divisor, and 7 the Quotient: and the Operation will stand thus:

9)63

7

If 78 is to be divided by 9, the Operation will be Here the Answer is 8, and 6 is the Remainder, because in 78 their are eight Nines and 6 over.

9)78

8--6

The general Method of proving the Truth of Division is this: "Multiply the Answer by the Divisor, and take in the Remainder, if any, and the Result will be equal to the Dividend, when the Operation is Right."—The following Examples will illustrate the foregoing Rules.

	4) 78906	5) 34567	6) 29702
Quotient	19726 -2	6913--2	4950--2
	4	5	6
Proof	78906	34567	29702

In the first of these Examples I say, the 4's in 7 once, nd there remain 3, which considered as Tens, and placed efore 8, the next Figure in the Dividend, makes 38; then he 4's in 38, 9 Times; 9 Times 4 is 36, from 38, and there emain 2; or two Tens, which carried to the 9, the next

Figure in the Dividend, make 29; then the 4's in 29, 7 Times; 7 Times 4 is 28, from 29, and there rests 1; which makes the 0, the next of the Dividend, 10, and the 4's in 10 twice; twice 4 is 8, from 10, and there remain 2; which make 6; the last Figure of the Dividend, 26; lastly, the 4's in 26, 6 Times, and 6 Times 4 is 24, from 26, and there rest 2 the Remainder: and so for the other two Examples. And for Proof of the Work multiply the Quotient by the Divisor, and take in the Remainder in the Place of Units; and if the Product be the same with the Dividend, the Division is right; for I say, 4 Times 6 is 24, and 2 the Remainder, make 26; 6 and carry 2, &c.

More Examples.

	3) 54321	7) 279060	9) 234567
Quotient	18107 3	39865--5 7	26063 9
Proof	54321	279060	234567

	8) 5987654	11) 9578651	12) 8955674
Quotient	748456--6 8	870786--5 11	746306-2 12
Proof	5937654	9578651	8955674

	11)72646206	12)76677240
Quotient	6604200--6 11	6389770 12
Proof	72646206	76677240

	11)47627000	12)42007400
Quotient	4329727--3 11	3500616--8 12
Proof	47627000	42007400

By being ready and dexterous in the Examples above, you may expeditiously divide by these Numbers, *viz.* 110, 120, 1100, 1200, *&c.* for it is but cutting off, or separating the Cyphers from 11 and 12, and cutting off and separating the like Numbers of Figures or Cyphers from the Right-hand of the Dividend, and then divide the other Figures or Cyphers towards the Left-hand, by 11 or 12, as it shall happen; as in the Examples following, *viz.*

Divide 34567 by 110, and 890123 by 120, and 98765 by 1100, and 678901 by 1200.

11,0)3456,7 — 12,0)89012,3

Quotient 314—27 — 7417—83

11,00)987,65 — 12,00)6789,01

Quotient 89—865 — 565—901

When we divide by 10, 100, 1000, or 10000, *&c.* you have nothing more to do than to cut off, or to separate so many Figures or Cyphers of the Dividend towards the Right-hand, as you have Cyphers in the Divisor, and those Figures towards the Left make your Quotient; and those cut off towards the Right-hand, the Remainder.

Examples.

Divide 123456789 by 10, 100, 1000, 10000.
By 10 the Quotient is 12345678, and the Remainder is 9.
By 100 the Quotient is 1234567, and Remainder is 89.
By 1000 the Quotient is 123456, and Remainder is 789.
By 10000 the Quotient is 12345, and Remainder is 6789.

When the Divisor consisteth of several Figures, then there ariseth a little more Difficulty in the Work; but if the folowing Directions are attended to, it is easily overcome; as vill be evident from the following Example, *viz.*

Suppose I am to divide 78901 Pounds among 32 Paishes; or suppose an Assessment of so much Money was aid on so many Parishes; what must each Parish pay by n equal Proportion towards raising such a Supply?

Divisor 32)78901(. . . . Quotient.

The Example thus set out, I begin at the Left-hand, eeking how often I can take 32 out of 78; or more easy, ow many Times 3 there is in 7, and the Answer is 2

Times; which I place in the Quotient thus 32)78901(2, and then according to the *General Rule*, I multiply the Divisor 32, by the 2 placed in the Quotient, saying, twice 2 is 4, and twice 3 is 6; so there is 64 to be taken out of 78, which should stand thus:

```
32)78901(2
   64.
   ---
   14
```

Then I make a Point under 9, the third Figure of the Dividend, and bring it down to the Remainder 14, and then the Work appears thus:

```
32)78901(24
   64 .
   ---
   149
```

Then I seek again, asking how many Times 32 in 149; which is not readily to be answered; but how many Times 3, the first Figure of the Divisor, is there in 14, the two first Figures of the Dividual 149, and the Answer is 4 Times; wherefore, after placing 4 in the Quotient, I multiply (as directed in the *General Rule*) the Divisor 32 by the said 4, saying 4 Times 2 is 8, placing it under 9 in the Dividual; then 4 Times 3 is 12, which set down under 14; so there is 128 to be taken out of 149, and then the Work appears thus:

```
32)78901(24
   64..
   ---
   149
   128
    ---
    210
```

And after Subtraction there remains 21; then I make a Point under 0 in the Dividend, and bring it down to the Right of the Remainder 21, and then there is 210 for a new Dividend; then I seek again, saying how many Times 32, the Divisor, is there in 210? Or easier, how many Times 3 in 21? ☞ But observe well, That whenever you have a Place more in the Dividend than in the Divisor, then always seek how oft you can take the first Figure of the Divisor, out of the two first of the Dividend, and the Answer is 7 Times; but it will not bear 7 Times, for 7 Times 32 is 224, and you cannot take 224 out of 210; or rather you cannot take 22 out of 21; wherefore try in your Mind before you set down the Answer, or Figure of the Quotient, whether it will go to the Number of Times as is most easily suggested; as here the Question or Demand is readily answered 7 Times; and so many Times 3 may be taken in 21; but when you come to multiply the whole Divisor by the Times you place in the Quotient, you begin at the Right-hand, and go towards the Left, carrying the Tens that arise to the next Place, which so increases the Product, that sometimes Subtraction cannot be made, because the under Line is greater than the upper; wherefore first try in your Mind, as has been said; and since it will not bear 7 Times, try if it will go 6 Times; saying, 6 Times 2 is 12, 2 and carry 1; and 6 Times 3 is 18, and 1 is 19; and 19 may be taken out of 21; therefore set down 6 in the Quotient, next to the 4, and multiply the Divisor 32 by it, nd the Work will stand thus:

32)78901(246
64...
———
149
128
———
210
192
———
181

Here the Divisor 32 multiplied by 6, gives 192 to be taken out of 210, and the Remainder is 18; to which after a Point made under it, I bring down the 1, the last Figure of the Dividend, and then there is 181 for a new Dividend, then according to the Rule, I seek again how many Times 32, the Divisor may be taken out of 181, or how many Times 3 in 18, and the ready nswer is 6 Times; but on the Trial I find it will not go 6 imes; wherefore I try a Quotient Fiure less by 1, *viz.* 5 Times, and find it ill bear it: and setting 5 in the Quoent next to the 6, I multiply the Divir 32 by it, and it produces 160; which ibtracted from 181, the last Remainder 21, and the Quotient or Answer 2465; which shews that 32 is ntained in 78901, 2465 Times and 1 over.

32)78901(2465
64...
———
149
128
———
210
192
———
181
160
———
21

Again, admit a Nobleman hath 30,000*l.* *per Ann.* what is s daily income?

If you divide 30,000 by 365 (the Days in the Year) the uotient will be the Answer. Set it down for working thus:

365)30,000(

First, seek how many Times 365 can be taken in 300? n equal Number of Places with the Divisor) Answer 0

Times; wherefore I go to a Place farther to the Right-hand, in the Dividend (for 0 must never begin the Quotient, as was said before) and make a Point under it, *viz.* under the last 0 but one, as may be seen in the Example; and there being a Place more in this Dividual than in the Divisor, I seek how oft the first Figure of the Divisor, *viz.* 3 is contained in the two first Figures or Places of the Dividend, *viz.* 30, and the Answer is 10 Times; but you are never to take above 9 Times at once, in any of these Examples of Division; wherefore try in your Mind whether it will bear 9 Times, before you set it down in the Quotient (as was said before) saying to yourself, or in your Mind, 9 Times 5 is 45, 5 and go 4; 9 Times 6 is 54, and 4 is 58; 8 and go 5; and 9 Times 3 is 27, and 5 is 32; now 32 cannot be taken out of 30, wherefore take a Figure less by an Unit or one, *viz.* 8 Times; and finding it will go 8 Times; set down 8 in the Quotient; and then say 8 Times 5 is 40; 0 and carry 4; and 8 Times 6 is 48, and 4 is 52; 2 and carry 5, and 8 Times 3 is 24, and 5 is 29; and then there is 2920 to be taken from 3000; and after Subtraction the Work will appear thus:

365)30000(8
2920.
———
80

Then to the Remainder 80, I bring down 0, the last Figur of the Dividend, and then there is 800 for a new Dividual then you must try how oft you can take 365 out of the saic Dividual 800, and the Number of Places being equal i both Divisor and Dividual, to wit, 3, ask how oft 3 in 8 answer twice; so put in the Quotient, and say Twice 5 i 10, 0 and carry 1; and twice 6 is 12, and 1 is 13; 3 anc carry 1; and twice 3 is 6, and one is 7; so there i 730 to be deducted from 800, and the Remainder is 70 as in the Work may be seen, viz.

365)30000(82
2920.
———
800
730
———
(70)

Thus it appears that the Nobleman hatl Eighty-two Pounds *per Diem*, and 70 over; which, if multiplied by 20, th Shillings in a Pound, would produc 1400 Shillings; and this divided by th Divisor, 365, there would come out 3 a Day more, and there will be a Remain dc der of 305, which multiplied by 12, the Pence in a Shilling, produces 3660; which divided still be 365, gives 10*d.* a Day more: So that 30,000*l.* a Year is 82*l.* 3*s.* 10*d.* a Day.

Once more, divide 46242 Gallons by 252, the Gallons in a Tun, thus set down:

```
252)46242(183
    252 . .
    -----
    2104
    2016
    -----
      882
      756
    -----
     (126)
```

In this Example, after Enquiry, I find that it will not go twice, therefore I set down 1 in the Quotient, and place 252 under 462 of the Dividend, and after Subtraction, the Remainder is 210; to which I bring down 4 from the Dividend, which makes 2104; and then seeking again, I find it will bear 8 Times, which placed in the Quotient, and the Divisor 252 multiplied by it, the Product is 2016 to be subtracted from 2104; which being done, the Remainder is 88: to which 2 the last Figure of the Dividend, being brought down, there is 882, and then seeking again I find it will go 3 Times; and the Product of the Divisor multiplied by 3, s 756; which subtracted from 882, there remains 126 for he true Remainder: So that by this Division I find there are 183 Tuns in 46242 Gallons, and 126 Gallons remaining, or over and above, which being half of 252 the Divisor, the Remainder is therefore half a Tun more.

When you have a Cypher or Cyphers on the Right-hand f the Divisor, in the first, second, or third Place, *&c.* seperate such Cypher or Cyphers, with a Dash of the Pen, from he rest of the Divisor; and also cut off as many Figures or Cyphers from the Right of the Dividend, as you cut off Cyphers from the Divisor, and divide the remaining Figures owards the Left-hand, by the remaining significant Figures f the Divisor.

Example.

Divide 42952 Square Poles of Land by 160, the Square Poles in an Acre of Land.

```
16,0)4295,2(268
     32 ..
     ———
     109
      96
     ———
      135
      128
     ———
      (7)
```

Here the Cypher is cut off from the Divisor, and the 2 from the Dividend; then I ask how oft 16 in 42; answer twice; then the 16's in 109, answer 6 Times; then the 16's in 135, answer 8 Times. So there are 268 Acres, and almost hal an Acre, in 42952 Square Poles.

```
Divide 27,00)62746,20)2323
             54 ...
             —
             87
             81
             —
              64
              54
             ——
             106
              81
              —
              25
```

In this Example two Cypher are separated from the Divisor and also two Places from the Dividend, and then 62746 i divided only by 27. See the Work.

When the Divisor is 3, 4, 5, 6, or more Figures, ther is a sure and easy Way of performing the work truly, b making a Table of the Divisor; which may be done b *Addition*, or by multiplying the Divisor by 2, 3, 4, &

Admit you are to divide 987654321 by 123456.

123456)987654321(8000 Times.

987648 ...

(6321)

1	123456
2	246912
3	370368
4	493824
5	617280
6	740736
7	864192
8	987648
9	1111104

Here having noted the Number of Figures in the Divisor, which here is 6, I make a Point under the sixth Figure, or Place of the Dividend, whereby 987654 becomes the first Dividual.

The foregoing Table is made by doubling the first Line, which makes 246912; this added to the first or uppermost Line, gives the third Line 370368; which also added to the said first Line, makes 493824 for the 4th Line, or Product; and so of the rest; still remembering to add the subsequent Line or Product to the first or uppermost Line, till you come to the last Line of 9 Times, which is 1111104; the Truth of which may be proved by multiplying the first or uppermost Line by 2, 3, 4, 5, &c. and if you commit an error by *Addition* it may be found or corrected by *Multiplication*.

The Use of the said Table.

When you have pointed out your Number of Places in the Dividend, cast your Eye on the Table, and at the first view you may know how many Times you can take, as in this Example 7 Times is too little, and 9 Times too much; wherefore I set down 8 in the Quotient, and place 987648, the tabular Number which stands against 8 under the Dividend, then I subtract that Number from it, and the Remainder is 6, to which I bring down 3, and place 0 in the Quotient; then to the 63, I bring down 2, and place 0 in the Quotient; then to 632, I bring down 1, the last Figure of the Dividend; but still it will not bear any Times or

Time, wherefore I put another 0 in the Quotient, and so the work is done, and the Quotient is 8000, and the Remainder 6321, as in the Work.

Thus having plainly, fully, and pertinently shewn by verbal Directions, the Method of working Division, I think it unnecessary to give any more Examples in that Manner, but shall leave some few Examples, for practice sake, whose Quotients and Remainders are expressed, but the Operation omitted; to save room, and for Trial of the ingenuity of Practitioners.

7400690042 divided by 987, the Quotient is 7498166, and the Remainder 200.

479679002742 divided by 4689 the Quotient is 102298784, and the Remainder 4566.

7969767002 divided by 976294, the Quotient is 8163, and the Remainder 279080.

456789012345 divided by 9876543, the Quotient is 46249, and the Remainder 8775138.

76469749 by 4500, Quotient 16993, and the Remainder 1249. And 8092320000 by 345000, Quotient 23456, and remains (0)

The Proof of Multiplication and Division.

THESE two Rules reciprocally prove each other; for in proving *Multiplication*, if you divide the Product by the Multiplier, the Quotient will be like the Multiplicand; or if by the Multiplicand, the Quotient will be the same with the Multiplier.

Ex. No. I.

345
24
1380
690
24)8280(345
72..
108
96
120
120
(0)

Ex. No. II. Or thus,

345)8280(24
690.
1380
1380
(0)

To prove Division.

Division may be proved by Division thus:

If you divide the Dividend by the Quotient, the Quotient will be your former Divisor.

Ex. Divide 8280 by 345.

345)8280(24

Here the working again is needless, it being just done, and shews the Truth of the Assertion, that *Division* may be proved by Division.

But the most usual Way of proving *Division* is by *Multiplication* in this Manner, viz. multiply the Quotient by the Divisor, and the Product will be equal to the Dividend. See the preceding Examples, No. 1.

345 *Quotient.*
24 *Divisor.*
———
1380
690
———
8280 *Proof.*
———

Note, That when there is any Remainder, such Remainder must be taken in, or added to the Product.

As in *Multiplication* I gave some Examples of its utility in Money, so likewise I shall give a few Examples in *Division of Money*; whereby may be seen how expeditiously Things may be done without having Recourse to Reduction, the Rule of Three, &c.

Ex. 1. Divide 26*l.* 12*s.* 6*d.* equally among five Men. For Disposition of working, set it down as follows:

	l.	*s.*	*d.*
	5)26	12	6
	5	6	6
			5
Proof	26	12	6

In the working of this, I say, the 5's in 26, 5 Times; 5 Times 5 is 25, from 26, and there remains 1, that is 1 Pound, or 20 Shillings; which with the 12*s.* in the Place of Shillings, makes 32*s.* then the 5's in the 32, 6 Times; 6 Times 5 is 30, from 32, and there remain 2*s.* or 24*d.* which with 6*d.* in the Place of Pence, makes 30; then the 5's in 30, 6 Times; and so the Work is done, and the Answer is, that each Man must have *l.* 5 6 6, for his equal Share in the said Division of *l.* 26 12 6 among five Persons; and the Truth of it is proved by Multiplication of Money, sufficiently shewn in the Rule of Multiplication; as here, 5 times 6 is 30, 6 and carry 2; and 5 times 6 is 30, and 2 is 32; 12 and carry 1; and 5 times 5 is 25, and 1 is 26, *&c.*

Ex. 2. Divide the Charges of a country Feast, amounting to *l.* 216 13 4 equally among 12 Stewards to know what each Steward must pay.

l. *s.* *d.*
12) 216 13 4

Ans. — 20 11 1--4

Here I say the 12's in 24 twice, and 12's in 6, 0 times, and there remains 6*l.* or 120*s.* and 13*s.* make 133; and then the 12's in 133 are 11, and there remains 1*s.* or 12*d.* and then 12 and 4 is 16; and the 12's in 16 once, and 4 remain; so that each Steward must pay *l.* 20 11 1, and something more than a Farthing; and this may be proved as that above.

When any Quantity is such a Number that any two Digits of the *Multiplication Table*, multiplied together, make the said Quantity or Number, then the Quotient may be very expeditiously found at two Divisions, and sooner than at one. *Example:* Divide 7872 by 32. In this Example, the component Parts, which, multiplied together, make the Divisor 32, are 4 and 8, or 8 and 4; for it matters not which of them you divide by first; for either way will give a true and the same Quotient; as may be seen by the different Methods of the following Work.

4)7872
8)1968
246 *Quotient*

Or thus, 8)7872
4)984
246 *Quotient.*

Here, though the Operations are different, yet the *Quotients* are the same. Again, divide 44184 by 56.

Example 3.

7)44184.
8)6312
789 *Quotient.*

Here the *Divisors* are 7 and 8, or 8 and 7; for either will give the same *Quotient.*

And thus may a great Number of Examples be wrought by Numbers out of the *Multiplication Table*, with great Dispatch and Expedition, as by 15, 18, 25, 35, 64, 72, 96, and by many other Numbers.

When it happens that there is any Remainder in the first Division, or the last, or both, to know the true Remainder as if you divided by the common Way, take this Method, *viz.* multiply the first Divisor by the last Remainder, and take in, or add the first Remainder, if there be any, and the Product will be the true or same Remainder, as if you divided by the long Way. *Example:* divide 4567 by 15.

3)4567

5)1522 1

304 2

(7)

Here I multiply 3, the first Divisor, by 2, the last Remainder, and take in 1, the first Remainder, and it makes 7 for the true Remainder, as may be proved at Leisure by the other Way.

The same Method may be taken with respect to component Parts in Division of Money, as in Division of simple Numbers: thus

	l.	*s.*	*d.*	
Divide 3)	463	18	6	into 18 equal Parts.
6)	154	12	10	
Answer	25	15	5–4	

By this Method of *Division of Money* you may, by having the Price of several Things, know the Price or Value of one Thing, at the said Rate, as well as by the *Rule of Three:* so doth *Multiplication of Money* answer Questions in the *Rule of Three*, when the first Number is a Unit, or 1. Thus, If 84lb. of Coffee cost 31*l.* 10*s.* 0*d.* what costs 1lb. Here 7 multiplied by 12, gives 84; therefore proceed as follows;

	l.	*s.*	*d.*
7)	31	10	0
12)	4	10	0
Answer	0	7	6

As in the Multiplication of Money, to have an Answer you multiply the Price by the Quantity, so in Division of

Money, you divide the Price by the Quantity, to have your Answer.

The various Uses of *Multiplication* and *Division* will be better understood by their Application in the following Rule of *Arithmetic* called

REDUCTION;

WHICH shews how to reduce Numbers of one Denomination to another, thereby discovering the same Value, though in different Terms.

1. As first, all great Numbers are brought into smaller by Multiplication, as Pounds into Shillings, Pence, or Farthings, by multiplying by 20, 12, or 4. Or hundreds weight into pounds weight, by multiplying by 4 and by 28, or by 112; or lower, into ounces or drams, by multiplying the Pounds by 16 and 16.

2. And on the contrary, all small Names are brought into greater by Division; as Farthings into Pounds, by dividing by 4, 12, and 20; and Pounds Weight into Hundreds Weight, by dividing by 28 and 4; the Drams into Pounds by dividing 16 and 16.

But you may note, That Pounds are brought into Pence, by multiplying by 240; or into Farthings by multiplying by 960; and just the contrary by Division.

Ex. 1. In 240*l.* sterling how many Pence?

20 Shillings 1 Pound.	*Or thus:*
———	240*l.*
4800 Shillings in 240*l.*	240*d.* in a *l.*
12 Pence 1 Shilling.	———
———	9600
Ans: 57600 Pence in 240*l.*	480
	———
	Answer 57600

Ex. 2. In 226 Tons of Copper, how many Pounds wt.

20 C. 1 Ton	
	Or thus:
4520 Hund. wt. in 226 Tons.	226 Tons,
4 qrs. 1 C.	20
18080 qrs. of a C. wt. in 226 Tons	4520
28 lb. 1 qr. of a C.	112
144640	54240
36160	4520
506240 Pounds wt. in 226 Tons	506240 Pds.

These foregoing Examples are great Names to be brought into small (as may easily be observed and understood) therefore as the Rule directeth, it is done by Multiplication, by multiplying the greater Name by the Number of the next lesser Name that makes one of the said greater; as in the first Example the lesser Name to Pounds is Shillings; wherefore I multiply by 20, because 20 of that lesser Name makes one of the said greater Name, *i. e.* 20 Shillings make a Pound. And the same Regard is had, and Method observed, in the Example of Weight as is very plain to be seen in the Work, and is called *Reduction Descending*, because it brings higher or greater Denominations into lower or lesser.

Ex. 3. Bring 4)494400 Farthings into Pounds.

	Or thus:
12)123600 Pence	96 | 0)49440 | 0(515*l.*
	480 . .
2 | 0)1030 | 0 Shillings	
	144
515 Pounds	96
	480
	480
	(0)

In this way I divide by 960 the Farthings in a Pound, &c.

In the first Way I divide the Farthings by 4, because 4 make a Penny, and the Quotient is Pence; then the Pence I divide by 12, because 12 make a Shilling, and that Quotient is Shillings; these I divide by 20 to bring them into

Pounds, thus: I cut off the Cypher in the Dividend towards the Right, for the Cypher that is in the Divisor 20, which is also separated from 2 with a Dash of the Pen, then I halve the Figures one by one, as they are united with the Remainder in the Dividend; which Half is Pounds, and is a short Way of dividing by 20; in the Example I say the Half of 10 (because I must not set down 0 at the beginning) is 5, and the Half of 3 is 1, but there remains 1, which makes the next, which is 0, 10; and the Half of 10 is 5; so that 10300 Shillings make 515 Pounds, or there are so many Pounds in 494400 Farthings.

Note, In dividing by 20, as above, if any Thing remain, it must be joined or annexed to the Figure or Cypher cut off; as suppose there had in the Halving the last Figure (excepting what you cut off) remained 1; then that 1 must have been joined to the Cypher separated or cut off, and there would have been 10 Shillings.

Ex. 4. Reduce 27552 Pounds Weight into Hundreds wt.

        4)
28)27552 (984
   252.. ———
   ———   246 Cwt. *Answer*
   235   ———
   224
   ———
    112
    112
    ———
    (0)

Or thus:

lb. Cwt.
112)27552(246 *Ans.*
    224..
    ———
     515
     448
     ———
      672
      672
      ———
      (0)

In the First of the two foregoing Examples, I divide the Pounds by 28 to bring them into Quarters; then I divide those Quarters by 4 to bring them into hundreds Weight, as in the Work.

In the second Way, I divide the pounds Weight by 112, the Pounds in a C. Weight, and it brings the pounds Weight into hundreds Weight at once.

The said Examples are of small Denominations to be brought into greater; and therefore it is done by Division, by dividing the lesser Name, by as many of them as make the next greater Name: that is by 28, because 28 of them make one of the next greater Name, *viz.* a Quarter of an Hundred, and this Reduction is called *Reduction Ascending*, because it brings low or small Names to higher or greater Denominations; by which may be observed, that all Questions in Reduction, whether ascending or descending, are answered either by Multiplication or Division, or by both; as will plainly appear in the Examples.

When it is required to reduce Numbers of several Denominations by *Reduction Ascending*, or by *Multiplication*, you are to work as before; but you must always remember to take in such Numbers as stand in the Place of the next inferior Denomination, as when you multiply the Pounds by 20, if there be any Shillings to the Denomination, or Place of Shillings, you must take them in; so likewise when you multiply the Shillings by 12, if there be any Pence in the Place of Pence, you must also take them in; and so when you multiply the Pence by 4, to bring them into Farthings, you must take in the Farthings, if there be any, in the Place of Farthings, as in the following Work.

l. *s.* *d.*
Ex. 5. In 346 16 9½ how many Farthings?
20 Shillings 1 Pound.

6936 Shillings in 346*l.* 16*s.* 0*d.*
12 Pence 1 Shilling.

83241 Pence in 346*l.* 16*s.* 9*d.*
4 Farthings 1 Penny.

332966 Farthings in 346*l.* 16*s.* 9½*d.*

The Example is so plain in the Work, that it hardly needs any Explication; but I begin to say 0 is 0, but 6 in the Units of Shillings is 6; then twice 6 is 12, and one in the Tens of Shillings is 13, 3 and carry 1; and twice 4 is 8, and 1 is 9, and twice 3 is 6: then by 12, saying 12 Times 6 is 72, and 9*d.* (in the Place of Pence) is 81, 1 and carry 8; and 12 Times 3 is 36, and 8 is 44, 4 and carry 4; and 12 Times 9 is 108, and 4 is 112, 2 and carry 11; and 12 6 is 72, and 11 is 83: then by 4, saying 4 Times 1 is 4, and 2 (in the Place of Farthings) is 6; 4 Times 4 is 16, and so on.

C. qrs. lb.
Ex. 6. In 56 2 16 of Tobacco, how many Pounds Weight?
4 qrs.

226 qrs. in 56 C. 2 qrs.
28 lb. 1 qr. of a C.

1814
453

Ans. 6344 Pounds Wt. in 56 *C.* 2 *qrs.* 16*lb.*

In the foregoing Work, I must multiply the 56 *C.* by 4 and take in two Quarters; and then I multiply the 226 Qrs. by 28, saying 8 Times 6 is 48, and 6 (the Unit Figure in the odd Pounds) is 54, 4 and carry 5, &c. Then I multiply by 2, saying twice 6 is 12, and 1 (that stands in the Place of Tens in the odd Pounds) is 13, 3 and carry 1, &c. Then adding the two Products together, they make 6344 Pounds, contained in 56 *C.* 2 *qrs.* 16*lb.* as in the Work is conspicuous.

Reduction Ascending

Is the bringing Numbers from a lesser Denomination to a greater, and is the Reverse of *Reduction Descending*; and each may serve as a Proof to the other, one being performed by *Multiplication*, and the other by *Division*.

If at any Time in *Reduction Descending* you take in, or add to, the odd Money, Weight, or Measure, as you multiply the several Denominations, such Quantities will be the Remainders in *Reduction Ascending*.

4) *Examples by the two foregoing Sums.*

In 332966 Farthings, how many Pounds? Divide by 4, by [12, and then by 20.

12)83241—½*d.* remains

2,0)693,6—9*d.* remains..

346—16*s.* remains.

So that in 332966 Farthings there are 346*l.* 16*s.* 9½*d.*

Again, in 6344 Pounds Weight, how many Hundreds Weight? Here divide by 28 and then by 4.

4)
28)6344(226 *qrs.*
56 . .
56 *C.* 2 *qrs.*
74
56
184
168
(16) Pounds remain.

So that in 6344 Pounds Wt. there is *56 C. 2 qrs. 16lb.* and these Instances prove the foregoing Examples descending to be right.

Now follow promiscuous Examples of both Kinds of Reduction, one proving the other.

In 276*l.* 12*s.* how many Pence?
20
5532
12
Ans. 66384*d.*

12
In 66384*d.* how many Pounds?
2,0)553|2
Ans. l. 276 | 12 and *Proof.*

In 47964 Grains, how many Pounds *Troy?*
2 | 0)
24)47964 (199 | 8
24. . . 12)99 18 Pwts.
239
216
236
216
204
192
Gr. (12)

In 8*lb.* 3 *oz.* 18 *pw.* 12 *gr.* *Quest.* How many Grains?
12
99
20
1998
24
7994
3997
Answer 47964 and *Proof.*

In 34 *C.* 3 *qrs.* of Wool, how many Pounds?

34 3 *qrs.*
4

139
28

1112
278

3892

Cwt.
112)3892(34 3 *qrs.*
336

532
448

84*lbs.* or 3 *qrs.*

In 456 *Cwt.* 3 *qrs.* 27*lb.* of Copper, how many Pounds? and what does it come to at 21 Pence *per* Pound?

Cwt. *qrs.* *lb.*
456 3 27
4

1827
28

14623
3656

51183 *lb.*
21

51183
2133

1074843 Pence; which divide by 12 and by 20 give 4478*l.* 10*s.* 3*d.* the Value of 456 *C.* 3*qrs.* 27*lb.* o Copper at 21 Pence *per lb.*

Bring 4796 Ells *Flemish* into Ells *English*; multiply by 3 and divide by 5, because 3 quarter make an Ell *Flemish*, and 5 an Ell *English*.

4796
3

5)14388

$2877\frac{3}{5}$

Reduc

Reduce 456 Ells *English* into Yards; multiply by 5, and divide by 4, thus

456 *English* Ells.
5 *qrs.* 1 *Eng.* Ell.
4)2280 qrs.
Yds. 570 *Answer.*

In 570 Yds. how many *Eng. E.*
4 qrs. 1 Yd.
5)2280
English Ells 456, *Answer* and *Proof.*

Bring 130 Tuns of Wine into Gallons.
4 Hogsheads 1 Tun.
520
63 Gallons 1 Hogshead
1560
3120
Ans. 32760 Gallons.

Or thus:
252 Gallons 1 Tun.
130 Tuns.
7560
252
32760

	Lasts.	*Quarters.*	*Bushels.*	*Pecks.*
Reduce	42	3	5	2 into Pecks.

10 qrs. 1 Last.
423
8 Bushels 1 *qr.*
3389
4 Pecks 1 Bushel.
13558 Pecks in 42 Lasts, 3 qrs. 5 Bushels, and 2 Pecks.

Here I multiply by 10, and take in 3 *qrs.* and then by 8 and take in 5 *Bushels*; and lastly, by 4, and take in 2 *Pecks.*

4)
In 13558 Pecks, how many Lasts, &c.
8)3389 2 Pecks taken in.
1 | 0)42 | 3 5 Bushels taken in.
Lasts 42 3 Quarters taken in.
Answer 42 Lasts, 3 Quarters, 5 Bushels, and 2 Pecks.

By *Reduction* also

Foreign Coins or Exchanges may be reduced to Sterling Money, and, on the contrary, Sterling Money to Foreign.

Example.

Reduce 246 *Venetian Ducats de Banco* into Sterling Money, the Exchange at 52*d.* Sterling *per* Ducat, thus:

```
              246
               52
              ———
              492
             1230
          ———————
          12)12792
        —————————
        2|0)106(6
        —————————
```

£. 53—6 To be paid in *London*, for the 246 Ducats drawn in *Venice*.

Reduce 53*l.* 6*s.* Sterl. into Ducats at 52*d.* Sterl. *per* Du.

```
     20
   ————
   1066
     12
  ——————————
 52)12792(246 Ducats to be paid in Venice for 53l. 6s.
    104            drawn in London.
  ——————————
     23, &c.
```

To reduce *Flemish* Money into *Sterling* Money, divid the Pence *Flemish* by the Course of Exchange, suppose 33*s.* 4*d.* and the Quotient will be the *Sterling* Money; and what remains, multiply by 20, &c.

Exampl

Example.

In 242*l.* 13*s.* 4*d.* *Flemish*, how many Pounds *Sterling*, &c.

```
                        242l. 13s. 4d.
                         20
                        ----
33s. 4d. Flemish.       4853
12                        12
----                 ---------
400               4 | 00)582 | 40
----                 ---------
                        145  Remains 240
                                      20
                           4 | 00)48 | 00
                                 ------
                                   12
                                 ------
```

Answer 145*l.* 12*s.*

By the Work it appears, that 145*l.* 12*s.* *Sterling*, answers, or is equivalent to 242*l.* 13*s.* 4*d.* *Flemish*, at 33*s.* 3*d.* *Flemish per* Pound *Sterling*.

Thus *Flemish* Money may be reduced to *Sterling* Money, though the Course of Exchange may be at any other Rate of Shillings and Pence *Flemish*; but when the Rate above, viz. 33*s.* 4*d.* then the Answer is sooner found by multiplying by 3, and dividing by 5; for 400*d.* *Flemish* is the same to 240*d.* *Sterling*, (each being a Pound) as 5 is to 3, for if you divide 400 by 5, it quotes 80; so 240, divided by 3, quotes the same.

The foregoing *Example* done by the last proposed Way.

```
 l.242  13  4 Flemish.
             3
 ------------
5)728   0   0
 ------------
 l.145  12  0
```

In 426 *French* Crowns, each 54*d*¼ *Sterling*, how many Pounds *Sterling?*

```
      426
       54¼
    ______
     1704
    2130
      106--2
   _______
  12)23110½
   ______________
 2 | 0)192 | 5  10d.
   ______________
 Ans. l. 96 : 5 : 10d.½
```

In this Example the Number of Crowns is multiplied by 54*d.* and for the ¼*d.* I take the 4th Part of 426, which is 106 $\frac{2}{4}$ of a Penny, or a Halfpenny, which added to the other Pence gives for Total 23110*d.* which divided by 12, quotes 1925, and 10*d.* remains: so the Answer is 96*l.* 5*s.* 10*d.* ½ *Sterling*, as in the Work.

Note, To multiply a Number by ¼, ½, ⅓, ⅛, &c. is the same as to divide the Number by 4, 2, 3, 8, &c.

Again, bring 1600 Pieces of Eight, at 54*d.*¼ *Sterling*, into Pounds *Sterling*.

```
     1600
       54¼
    _____
     6400
    8000
      400
  _____________
  12)86800 Pence.
  _____________
  2 | 0)723 | 3—4
  _______________
    l. 361 : 13 : 4
  _______________
```

Here the 1600 Pieces of Eight are multiplied by 54, to bring them into Pence, and for the ¼ I take the ¼ of 1600, &c. as in the Work; and the Answer is *l.* 361 : 13 : 4.

This Method is of Use in reducing the Exchanges of *Cadiz*, *Leghorn*, and *Genoa*. Or when the Exchange is at so many Pence and Eights of a Penny, (as often the Exchanges run) then multiply the given Number to reduce it into Pence, by the Pence contained in a Piece of Eight; and also multiply the said given Number apart, by the Numerator or upper Figure of the Fraction, and divide by the Denominator or under Figure of the Fraction, and the Quotient will be Pence; which add to the other Pence produced by multiplying the given Number by the

Pence contained in one of the Pieces for Exchange, then divide the Total Pence by 12, &c.

Example.

Bring 296 Dollars at 52*d.* $\frac{5}{8}$ *Sterling* into Pounds *Sterling.*

```
          296
           52
         ----
          592          296 Dollars.
         1480            5
        -----         ------
        15392         8)1480
          185         ------
        -----           185
     12)15577
     --------
  2 | 0)129 | 8 : 1
          ---------
```

Answer *l.* 64 : 18 : 1 *Sterling* Money due for 296 Dollars, at 52*d*$\frac{5}{8}$ *Sterling per* Dollar.

But *Ducats, Dollars, Crowns,* &c. are more expeditiously cast up by the Rules of Practice hereafter to be shewn.

The next Rule in *Arithmetic* is

The GOLDEN RULE, or RULE OF THREE.

It is called the *Golden Rule* from its excellent Performance in *Arithmetic,* and in other parts of *Mathematical* Learning.

And it is called the *Rule of Three,* because from three Numbers given, proposed, or known, we find out a fourth Number required, or unknown, which bears such Proportion to the third, as the second doth to the first Number: from whence also it is called the *Rule of Proportion.*

And of this *Proportion* there are two Sorts; one called *Direct,* and the other *Indirect* or *Reverse.*

Direct Proportion is when the second and third Numbers are to be multiplied together, and their Product divided by the first.

Indirect, or *Reverse Proportion,* is when the first and second Numbers are to be multiplied together, and their Product divided by the third.

In *Direct Proportion,* the fourth Number, or Answer to the Question contains the third Number as often (or as many Times) as the second contains the first.

But in *Indirect Proportion,* the greater the third Number is, the less is the fourth; and the lesser the third number is, the greater is the fourth.

The Stating the Question.

The chief Difficulty that occurs in the *Rule of Three,* is the right placing the Numbers, or stating the Question; for when that is done, you have nothing more to do, but to multiply and divide, and the Work is done.

And to this End, we are to remember, that of the three given Numbers, two of them are always of one Denomination, and the other Number is of the same Name with the fourth Number or Answer required; and must always be the second or middle Number: And the Number that asketh the Question, must possess the third or last Place, and the other Number of the same Name with the third, must be the first Number; for the first and third Numbers must always be of one Name, viz. both Money, both Weight, both Time, or both Measure. And though they be of one Kind, yet if one of them is altered, by *Reduction,* from a higher to a lower Name, then the other must be reduced to the same Name. That is, if either the first or third Number consist of several Denominations, that is, of Pounds and Shillings; or Pounds, Shillings, and Pence; or of Pounds, Shillings, Pence, and Farthings; or of Tons, Hundreds, Quarters, and Pounds, &c. then must they be reduced to the lowest Name mentioned. And if any one happens to be of divers Denominations, and the other but of one Name; then the Number of one Name must be reduced as low, or into the same Name with the other. As suppose the first Number is brought into Farthings, the third Number also though but Pounds, must be brought into Farthings. Then you are to multiply the second and third Numbers together, (when the Proportion is Direct) and divide the Product by the first Number, and the Quotient thence arising will be the Answer to the Question, and in the same Name with the middle Number: And if in the small Denomination, it must be brought by Division to the highest Name for the better understanding the Answer. If the middle Number be of several Denominations, it must be brought into the lowest mentioned.

Example 1.

If 12 Gallons of Brandy cost 4*l.* 10*s.* what will 134 Gallons cost at that Rate.

Stated for working thus

Gall. *l.* *s.* *Gall.*
If 15 4 10 134
20 90
90 15)12060
2 | 0)80 | 4
£.40 | 4

Here the first and third Numbers are of like Names, viz. both Gallons; and 134 being the Number that asks the Question, it hath the third Place, as it always must, as before asserted; and 4*l.* 10*s.* the second Number, being of two Denominations, viz. Pounds and Shillings, it is reduced into the lowest mentioned, viz. Shillings, as before directed, and then the three Numbers are these, viz. 15—90—134; and 134 the third Number being multiplied by 90, the second Number, produces 12060; which divided by 15, the first Number quotes 804, which are Shillings, because 90 the middle Number, were Shillings; and 804 Shillings, divided by 20 give 40*l.* 4*s.* for the Answer: for the Proof of its Truth, state it back again thus:

Gal. *l.* *s.* *Gal.*
If 134 cost 40 4 what cost 15
20
804
15
4020
804
134)12060 (90*s.* *Answer*, or 4*l.* 10*s.* the Cost of 12 Gallons, and this is a Proof of the first Work; and the Back stating and working
1206
....0

he Proof is as much a Question in the Rule of three as the irst.

By the foregoing Rule and Directions, and these Examples, the Nature of the Rule, and Method of working, may be understood; I shall therefore only give the Examples stated, and a little of the Work, and the Answers to the Questions, leaving most of the Operations to be performed by the ingenious Practitioners.

Ex. 3. If 56*lb* of Indigo cost 11*l.* 4*s.* what will 1008*lb.* cost at that Rate?

	lb.	*s.*	*lb.*	
If	56	224	1008?	*Answer* 4032*s.* or 201*l.* 12*s.*

Ex. 4. If half a C. Wt. of Copper cost 4*l.* 18*s.* what Quantity will 14*s.* buy at that Rate?

	s.		*lb.*		*s.*	
If	98	buy	56,	what	14?	*Answer* 8*lb.* of Copper.

Ex. 5. If 4 C 3 qrs. Sugar cost 5*l.* 15*s.* 7*d.* what will 4 Hogsheads come to, weighing 42 *C.* 1 *qr.* 14*lb.?*

	lb.	*d.*	*lb.*	
If	532	1387	4746?	*Answer* 12373 Pence, or 51*l.* 11*s.*

1*d.* And the Remainder, 266, multiplied by 4, gives 1064; which also, divided by the first Number, 532, gives a Halfpenny more; so the whole is 51*l.* 11*s.* 1*d.*½.

Any of these Examples, or any other, may be proved by a Back-stating, according as the first Example was proved; and each Proof becomes another Question in the Rule o Three as was said before.

Ex. 6. If I have 50*l.* a Year Salary, how much is due to me for 144 Days Service at that Rate?

	Days.	*l.*	*Days.*		*l.*	*s.*	*d.*
If	365	50	144?	*Answer,*	19	14	6 $\frac{90}{365}$ Parts of a Penny.

In this Example, the Product of the third by the secon Number is 7200; which divided by the first 365 (according to the Rule) quotes 19 Pounds, the Name of the middl Number, and there is a Remainder of 265; which multiplied by 20, according to Reduction, and the Product stil divided by 365, there comes out 14 Shillings; and yet there is a Remainder of 190, which multiplied by 12, and the Product divided by 365, gives 6*d.* and there is a Remainde 90; which if multiplied by 4 (the last inferior Name) an divided by 365, yet would not come to a Farthing more; s that the Answer is above, *l.* 19 14 6$\frac{90}{365}$.

Whic

When the first of the three given Numbers is an Unit or One, the Work is performed, or Answer found, by Multiplication only.

Ex. 7. If I am to give 17s. for 1*lb.* of *Belladine* Silk, what must I give for 264*lb.* at that Rate?

lb. *s.* *lb.*
If 1———17———264
17
———
Answer 4488*s.* or 224*l.* 8*s.*

Ex. 8. If I buy 49 Bags of Hops at 12*l.* 12*s.* 6*d.* *per* Bag, what come they to at that Rate?

Bag *l.* *s.* *d.* *Bags.*
1———12 12 6———49
Multiply by 7 and by 7
———
88 7 6
7
———
618 12 6
———

The foregoing Work is performed by the component Parts as taught in *Multiplication,* because 7 times 7 is 49.

When the third, or last of the three given Numbers is an Unit, or One, the Work is performed by *Division.*

Ex. 9. If 12 Ells of Holland cost 3*l.* 6*s.* what is the Price of 1 Ell at that Rate?

Ells. 12) *s.* Ell.
If 12———66———1 *Answer* 5*s.* 6*d.*
———
$5\frac{6}{12}$ of 1*s.* or 6*d.*

Ex. 10. If 56 Yards of Broadcloth cost 40*l.* 12*s.* what is the price of a Yard, at that Rate?

Yds. 7) *l.* *s.* Yd.
If 56———40 12———1 *Ans.* 14*s.* 6*d.* *per* Yard.
———
8) 5 16
———
0 14 6*d.* *Answer.*

This Example is wrought by *Division of Money,* and by 7 and 8 the component Parts; as before taught in the *Rule of Division.*

Ex. 11. If *A* owes *B.* 296*l.* 17*s.* and compounds at 7*s.* 6*d.* in the Pound; what must *B.* take for his Debt?

s. d. s.
If 20——90——5937. *Answer l.* 111 6 $4\frac{1}{2}$

Ex. 12. If a Gentleman hath an Estate of 500*l.* a Year; what may he expend daily, and yet lay up 12*l.* 15*s.* *per* Month?

First multiply 12*l.* 15*s.* by 12, the Months in a Year, and it makes 153*l.* which deducted from 500*l.* the Remainder is 347*l.* Then say,

Days. *l.*
If 365———347, what 1 Day? *Answer* $19s.\frac{5}{365}$

After you have reduced the Pounds into Shillings which make 6940, you divide them by 365, and the Quotient is 19*s.* *per* Day, and 5 remains over, which being placed over the Divisor 365 gives $19s.\frac{5}{365}$

The Rule of Three Inverse, or of Indirect Proportion.

BUT in *Indirect Proportion*, the Product of the Third and Fourth Numbers is equal to the Product of the First and Second.

The Method of stating any Question in this Rule, is the same with that of the *Direct Rule.*

For the First and Third Numbers must be of one Name, and so reduced, as in that Rule; and the Number that asks the Question must possess the Third Place; and the Middle Number will be of the same Name with the Answer as it is there.

To know when the Question belongs to the Direct, *and when to the* Inverse Rule.

When the Question is stated as aforesaid, consider whether the Answer to the Question ought to be *more* or *less* than the Second Number: if more, then the lesser of the First and Third Numbers must be your *Divisor.*

But if less, then the greater of the two extreme Numbers must be your *Divisor.*

And if the First Number of the Three is your *Divisor,* then the *Proportion* is *Direct;* but if the last of the Three is your *Divisor,* the *Proportion* is *Indirect* or *Inverse.*

Or without Regard to *Direct* or *Reverse,*

$\left.\begin{array}{l}\text{If more is required, the Lesser}\\ \text{If less, the Greater}\end{array}\right\}$ is the *Divisor.*

Examples

Examples for Explanation.

Ex. 1. If 4 Men plane 250 Deal Boards in 6 Days; how many men will plane them in 2 Days?

If 6 Days require 4 Men, what 2 Days? *Ans.* 12 Men.
6
———
2)24
———
12 *Ans.*
———

Ex. 2. If a board be 9 Inches broad, how much in Length will make a Square Foot?

In B. In L.
If 12———12, what 9 Inches broad?
12
———
9)144
———
Answer 16 Inches in Length.

In these Examples, the first and second Numbers are nultiplied together, and the Product is divided by the Third; for, in the first Example, it is most certain, that 2 Days will require more Hands to perform the Work han 6 Days; therefore the lesser of the extreme Numbers s the *Divisor;* and declares the Question is the *Indirect roportion.*

Likewise, in the Second Example, 9 Inches in Breadth, ust needs require more in Length to make a Foot, than 12 nches in Breadth; wherefore it is in the same *Proportion* ith the First Example, because the *Divisor* is the Third umber.

Ex. 3. How many Yards of Sarsenet, of 3 *qrs.* wide, will ne 9 Yards of Cloth of 8 *qrs.* wide?

rs. wide. *yds. long.* *qrs. wide.*
If 8———9 what———3
8
———
3)72
———
Yards 24 *Answer.*

Here the narrower the Silk, the more in Length is required, of course 8 must be the Multiplier, and 3 the Divisor.

Ex. 4. If a Loaf weigh 4*lb.* ½ when Wheat is 5*s.* 6*d.* the Bushel, what must it weigh when Wheat is 4*s.* the Bushel?

d. *Half lb.* *d.* *lb.*
If 66———9———48 *Answer* $6\frac{3}{8}$

Ex. 5. If in 12 Months 100*l.* Principal gains 5 Pound Interest, what Principal will gain the same Interest in 5 Months.

M. *l. P.* *M.*
12———100———5
12

5)1200

Answer 240*l.* Principal.

The Double Rule of Three Direct.

IN this Rule there are Five Numbers given to find ou a Sixth, which is to be in Proportion to the Product of th Fourth and Fifth Numbers, as the Third Number is to th Product of the First and Second Numbers.

Questions in this Kind of *Proportion* are wrought eithe by two Operations in the *Single Rule of Three Direct*, or b the Rule composed of the Five given Numbers, and the on may be a Proof to the other: as may be seen in the followin Example.

Ex. 1. If 100 Pounds Principal in 12 Months, gain Pounds Interest, what will 246 Pounds Principal gain in Months?

If 100 gain 5, what will 246
5

1 | 00)12 | 30
20

1 | 00) 6 | 00 *Answer* 12*l.* 6

Th

M. *l.* *s.* *M.*
Then say again, if 12 gain 12 6 what 7
20

246
7
---
12)1722

2|0) 14 | 3 6*d.*
---
l. 7 3 6*d.*

In the first Stating, the Answer is, that if 100*l.* gain 5 Pounds, then 246*l.* will gain 12 Pounds 6 Shillings.

Then I say in the next Stating, if 12 Months gain 12*l.* 6*s.* what will 7 Months? and the Answer is 7*l.* 3*s.* 6*d.* And so much will 246 Pounds gain in 7 Months, if 100 Pounds gain 5 Pounds in 12 Months.

You must particularly note, That in all Operations where the Answer to the Question is found by two Statings of the Rule of Three, the Answer of the first Stating is the middle Number of the second Stating; as in the preceding Example.

This mark × when it stands between two Numbers denotes that the Numbers are to be multiplied into one another: thus 9 × 5 signifies that 9 is to be multiplied into 5 and the Product is 45.

The foregoing Question may be answered by a Stating composed of the Five given Numbers thus:

(1) (2) (3) (4) (5)
L. M. L. L. M.
If 100 × 12——5——246 × 7
12 7
1200 1722
5
12,00)86,10

L. 7——210
20
12,00)42,00
s. 3----600
12
12,00)72,00
d. 6

In this Work in Stating the Question, the First and Fourth Numbers are made of one Name, as are the Second and Fifth; then the two first Numbers are multiplied together for a Divisor, and the last Three Numbers are multiplied together for a Dividend, and the Quotient, or Answer is of the same Name with the Middle Numbers, viz. Pounds, Interest. In the work I find the first Quotient 7 Pounds Interest: and so I proceed from one Denomination to another, till I find the same Answer as in the Work at two Statings, viz. 7*l.* 3*s.* 6*d.*

This Method of Operation serves to answer all Questions in the *Double Rule of Three Direct.*

The Double Rule of Three Reverse.

IN this Rule you must place your Numbers in such Order that your Second and Fourth Number may be of one Name or Denomination, and your Third and Fifth.

Ex. If 100*l.* Principal, in 12 Months, gain 6*l.* Interest, what Principal will gain 20*l.* Interest in 8 Months?

Stated thus:

	(1)		(2)		(3)		(4)		(5)
	l. P.		*Mo.*		*l. Int.*		*Mo.*		*l. Int.*
If	100	×	12	——	6	×	8	——	20
	12						6		
	1200						48 the Divisor.		
	20								

48)24000(500*l.* Principal *Answer.*
240

(0)

In this Work, the Third and Fourth Numbers are multiplied together for a Divisor; and then the First is multiplied by the Second, and that Product by the fifth Number, and the Product, 24000, is divided by 48, and the Quotient is 500*l.* Principal; which is the Answer to the Question, as may be seen in the Work.

Rules of Practice.

THESE Rules are so called from their frequent Use and Brevity in finding the Value of most Sorts of Goods or Merchandize; for any Question in the Rule of Three, when the first Number in the Stating is 1, is more briefly done by these Rules, called Practice.

But previously to these Rules, it is necessary to have the following Tables by Heart.

Parts of a Shilling.		*Of a Pound.*
d.		
6 is	$\frac{1}{2}$	$\frac{1}{40}$
4	$\frac{1}{3}$	$\frac{1}{60}$
3	$\frac{1}{4}$	$\frac{1}{80}$
2	$\frac{1}{6}$	$\frac{1}{120}$
$1\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{160}$
1	$\frac{1}{12}$	$\frac{1}{240}$

Parts of a Pound.		
s.	*d.*	
10	0 is	$\frac{1}{2}$
6	8	$\frac{1}{3}$
5	0	$\frac{1}{4}$
4	0	$\frac{1}{5}$
3	4	$\frac{1}{6}$
2	6	$\frac{1}{8}$
2	0	$\frac{1}{10}$
1	8	$\frac{1}{12}$
1	0	$\frac{1}{20}$

Parts of a Shilling.

6*d* is ½ of 1*s*. | *Ex.* I. 426 Pounds of Sugar, at 6*d. per lb.*

2|0) 21|3

l. 10 13 *Answer.*

Here 6*d.* being the Price of each *lb.* and the Half of a Shilling; therefore the Half of 426 is taken, and gives 213*s.* or 10*l.* 13*s.* for the Value of the Sugar.

4*d.* is ⅓ of 1*s.* | *Ex.* II. 512*lb.* of Cheese, at 4*d. per lb.*

2|0) 17|0 8*d.*

l. 8 10 8 *Answer.*

Here 4*d.* is ⅓ of a Shilling; therefore the third Part of 512 is 170*s* and ⅔ of a Shilling, or 8*d.* remains.

The Remainder is always of the same Name with the Dividend, which here is Groats, for the Pounds of Cheese are at a Groat each.

3*d.* is ¼ of 1*s.* | *Ex.*III. 246 Yards of Ribband, at 3*d. per* Yard.

2|0) 6 | 1 6*d.*

l. 3 1 6 *Answer.*

Here the Yards are divided by 4, because 3*d.* is the 4th of a Shilling, and it quotes 61 Shillings, and 2 remains, or two 3 Pences: So the Answer is *l.* 3 1*s.* 6*d.*

And thus may any proposed Question be answered, belonging to the first Table, or Parts of a Shilling; that is, by dividing the given Number by the Denominator of the Fraction, and the Quotient will be always Shillings, which (the Remainders being known as above) bring into Pounds, by dividing by 20, *&c.*

When the Price of the Integer is at a Farthing, a Halfpenny, or three Farthings more than the Value of the Pence mentioned, then for those Farthings, take a proper Part of the foregoing Quotient found for the Pence, and add them together.

Ex. 249 Ells of Canvas, at 4*d.*$\frac{1}{2}$ *per* Ell.

4*d.* is $\frac{1}{3}$ |
$\frac{1}{2}$*d.* is $\frac{1}{8}$ | 83
of 4*d.* | 10 $\frac{3}{8}$ or 4*d.* $\frac{1}{2}$.

2|0) 9|3 4 $\frac{1}{2}$

l. 4 13 4 $\frac{1}{2}$ *Answer.*

In this Example I divide by 3 for the Groats, as being the Third of one Shilling, and it quotes 83*s.* then I consider that a Halfpenny is the Eighth of 4*d.* therefore I take the Eighth Part of the Groat Line, or 83*s.* and that produces 10*s.* and $\frac{3}{8}$ of a Shilling, or 4*d.* $\frac{1}{2}$; then the two Lines being added together, makes 93*s.* 4*d.* $\frac{1}{2}$, or 4*l.* 13*s.* 4*d.* $\frac{1}{2}$ as in the Work.

Parts of a Pound.

10*s.* is $\frac{1}{2}$ | 254 Yards of Cloth, at 10*s.* *per* Yard.

l. 127 *Answer.*

Here the Half of 254 is taken; because 10*s.* is the Half of a Pound.

s. *d.* 972 Gallons, at 6*s.* 8*d.* *per Gallon.*
6 8 is $\frac{1}{3}$ |

l. 324 *Answer.*

Here the third Part is taken, because 6*s.* and 8*d.* is the third of a Pound; and the Answer is *l.* 324.

And thus may any Question proposed be answered, belonging to the second Table, or Parts of a Pound; that is, by dividing the given Number by the Denominator of the Fraction, and the Quotient will always be Pounds; and if any Thing remains, it is always so many Halves, Thirds, Fourths, or Fifths, &c. of a Pound, according to the Denominator that you divide by.

If the Price be Shillings and Pence, or Shillings, Pence, and Farthings, and no even Part of a Pound; then multiply the given Number of the Shillings in the Price, and take even Parts for the Pence, or Pence and Farthings, and add the several Lines together, and they will be Shillings; which Shillings bring into Pounds as before.

Examples.

lb. *s.* *d.*
426 at 4 9
4
6*d.* ½ | 1704
3*d.* ½ | 213
of 6*d.* | 106½ or 6*d.*
2|0) 202|3 6
l. 101 3 6 *Answ.*

Ells. *s.* *d.*
216 at 2. 3½
2 *per* Ell.
3*d.* ¼ | 432
½*d.* ⅙. | 54
of 3*d.* | 9
2|0) 49 | 5*s.*
l. 24 15 *Answ.*

396 Gallons of Brandy, at 7*s.* 9*d.* *per* Gallon.
7
2772
6*d.* ½ of 1*s.* | 198
3*d.* ½ of 6*d.* | 99
2|0) 306|9
l. 153 9 *Answ.*

When the Price is 10*d.* only; annex 0 to the Right of the given Number (which is multiplying by 10) and they are Pence; which divide by 12 and 20

Example; 426*lb.* of Hops, at 10*d.* *per lb.*
12)4260
2|0) 35|5
l. 17 15 *Answer.*

When the Price is 11*d.* set down the Quantity twice in the Form of Multiplication, and add the two Lines together, then divide by 12 and 20.

Example.

426 *lb.* of Copper, at 11*d.* *per lb.*
426
12)4686 *Pence.*
2|0) 39 | 0 6
l. 19 10 6 *Answer.*

If the Price be 11*d.* ½ proceed as before, and take Half the uppermost Line, &c.

Example.

942*lb.* of Tobacco at 11*d* ½. *per lb.*

942
471

12)10833

2|0) 90 | 2 9

l. 45 2 9 *Answ.*

When the Price is 1*s.* only, divide by 20, and you have the Answer at once.

Example.

2|0) 96 | 4*lb.* of Tobacco, at 12*d. per lb.*

l. 48 4 *Answer.*

When the Price is 2*s.* it is done at Sight, by doubling the last Figure towards the Right-hand; and setting it apart for Shillings; and the Figures towards the left are Pounds.

Example.

596 Gallons of Spirits, at 2*s. per* Gallon.

l. 59 12 *Answer.* Here the Double of 6 is 12, and the 59 are Pounds.

From this Method of working by 2*s.* a Multitude of Examples may be most expeditiously wrought, *viz.*

	Ells.	*Yards.*
	444 Cambrick at 5*s.* 9*d.*	426 at 3*s.* 6*d. per* Yard.
	44 8 at 2*s.*	42 12 at 2*s.*
	44 8 at 2*s.* 1*s.* ½ 2*s.*	21 6 at 1*s.*
1*s.* ½ of 2*s.*	22 4 at 1*s.* 6*d.* ½ 1*s.*	10 13 at 6*d.*
6*d.* ½ of 1*s.*	11 2 at 6*d.*	
3*d.* ½ of 6*d.*	5 11 at 3*d.*	74 11 at 3*s* 6*d.*
Answer l.	127 13 at 5*s* 9*d.*	

The Operation of these two Examples is so intelligibly wrought, that there is no need of verbal Explanation.

Again, 548 Yards of Broad Cloth, at 12*s*. 6*d*. *per* Yard.

l. 54 16 at 2*s*.
6 Times 2 is 12*s*.

6*d*. is ¼ of 2*s*. | 328 16 at 12*s*.
13 14 at 6*d*.

l. 342 10 *Answer*.

Note, *That* 13*l*. 14*s*. is the *fourth Part of* 54*l*. 16*s*. *the two Shilling Line*.

Or multiply by 12*s*. take Half of the given Number for the 6*d*. thus, and divide by 20, the Answer is in Pounds.

548 Yards.
12

6576
½) 274

2|0) 685|0

l. 342 10 *Answer*.

When the Price is an even Number of Shillings, multiply the Numbers of Integers by Half the Price, and double the first Figure of the Product for Shillings, and carry, as is usual in Multiplication, and the other Figures towards the Left will be Pounds.

Example.

296 Yards of Cloth, at 14*s*. *per* Yard,
7 the Half of 14*s*.

l. 207 4*s*. *Answer*.

Here 7 Times 6 is 42; the Double of 2*s*. is 4*s*. *&c*.

When the Price is an odd Number of Shillings, work for the even Number as above; and for the odd Shillings take the $\frac{1}{20}$ of the given Number, and add them together.

Example.

Example.

496 Gallons of Citron Water, at 17*s.* *per* Gallon.
8 Half of 16*s.*

l. 396 16*s.*
24 16.

l. 421 12 *Answer.*

In this Example I say, 8 Times 6 is 48, the Double of 8 is 16*s.* and carry 4; then 8 Times 9 is 72, and 4 is 76, 6 and carry 7; and 8 Times 4 is 32, and 7 is 39; then the Half of 4 is 2, *&c.*

I have not here Room to speak of the various and almost infinite Methods and Rules of *Practice*, but I shall leave some general Rules, which, if heedfully noted, will be of great Use to Learners; and these are

1. When the Price is Parts of a Farthing, or of a Penny, and $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, *&c.* then multiply the Integers by the Numerator, and divide by the Denominator, and the Result will be either Farthings or Pence: which reduce to Pounds, *&c.*

2. When the Price is Pence, and no even Part of a Shilling; as suppose 5*d.* 7*d.* 8*d.* or 9*d.* then it may be done by taking their Parts, as 3*d.* and 2*d.* is 5*d.* and 4*d.* and 3*d.* is 7*d.* and 4*d.* and 4*d.* is 8*d.* and 6*d.* and 3*d.* is 9*d.* but it is an easy and sure Way to multiply the given Number by 5, 7, 8, or 9, then the Product is Pence, which bring to Pounds by *Reduction.*

3. When the Price is Pence and Parts of a Penny; as 1*d*$\frac{1}{4}$, 2*d*$\frac{1}{2}$, or 6*d*$\frac{3}{4}$, then work for the Penny by taking the $\frac{1}{12}$; for 2*d.* the $\frac{1}{6}$; and for 6*d.* the $\frac{1}{2}$: Then for the Farthing, take $\frac{1}{4}$ of the Penny Line, and for $\frac{1}{2}$, $\frac{1}{4}$, of the Two-penny Line; and for $\frac{3}{4}$, take $\frac{1}{8}$ of the Six-penny Line; then add the Results together, and the Total will be Shillings, which reduce to Pounds by dividing by 20. Or by the sure Way of bringing the mixt Number into the lowest Denomination; as 1*d*$\frac{1}{4}$, into 5 Farthings; 2*d*$\frac{1}{2}$, into 5 Halfpence, and 6*d*$\frac{3}{4}$, into 27 Farthings; then multiply the Integers by 5, and the Product is Farthings; or by 5 Halfpence, and the Product will be Halfpence; or by 27 Farthings, and the Product will be Farthings; which, whether Farthings, or Pence, reduce to Pounds, *&c.*

4. When the Price is Shillings and Pence, or Shillings,

Pence, and Farthings; multiply the Integers by the Shillings of the Price, and take Parts of the Pence, or Pence and Farthings, *&c.*

5. If the Price be Pounds and Shillings, or Pounds, Shillings, Pence, and Farthings, multiply by the Shillings in the Price, that is, in the Pounds and Shillings, and take Parts for the Pence and Farthings.

6. When the Number of Integers hath a Fraction annexed, or belonging to them, as $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, *&c.* then take $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$, of the Price of one of the Integers, and add that to the other Results.

TARE and TRETT, &c.

Gross Weight is the Weight of the Goods in Hundreds, Quarters, and Pounds, with the Weight of the Hogshead, Cask, Chest, Bag, Bale, *&c.* that contains the Goods.

Tare is allowed to the Buyer for the Weight of the Hogshead, Cask, Chest, Bag, Bale, *&c.*

Trett is an Allowance made for Waste, Dust, *&c.* in sundry Sorts of Goods, as Tobacco, Cotton, Pepper, Spices, *&c.* and is always 4*lb. per* 104*lb.* Suttle, and found by dividing the Suttle Pounds by 26, because 4 Times 26 make 104*lb.* When the Gross Weight is brought into Pounds, and before the Tare is deducted, they are called *Pounds Gross;* and after the Tare is subtracted, the remaining Pounds are called *Pounds Suttle,* which divided by 26 (as said before) quotes Pounds Trett, *&c.*

Tare

Tare at so much Cask, Hogshead, Bag, &c.

The Allowances for Tare are variously wrought, as by the following Examples:

In 12 Casks of Indigo, containing 45 *C.* 1 *qr.* 14*lb.* Gross, Tare 30*lb. per* Cask, how many Pounds Nett?

12 — *C.* *qr.* *lb.*
30 — 45 1 14
360 Pounds Tare. — 4

181
28

1462
362

5082
Subtract - 360

Answer 4722

In this Example, the *lbs.* Tare of one Cask are multiplied by the Number of Casks, and the Product is 360 Pounds Tare; and the Gross Weight is reduced into Pounds by the Method shewn in Reduction of Weight; and then the Pounds Tare are deducted from the Pounds Gross, and the Remainder is Pounds Nett, *viz.* 4722, as in the Work.

When the Tare is at so much *per Cwt.* multiply the Number of Hundreds by the Tare, and take Parts for the odd Weight, and add it to the Tare found by Multiplication, and divide it by 112 to bring it into Gross Weight in order for Subtraction.

Example.

What is the Nett Wt. of 12 Casks of Argol, Wt. Gross, 84 *C.* 2 *qrs.* 14*lb?*

84
14 Tare *per* *C.*

336
84
7 for half *C.*
1¾ for 14*lb.*

112)1184¾(10 *C.*
112

64*lb.* or half a *C.* and 8*lb.*

C. *qrs.* *lb.*
84—2—14
10—2— 8¾ Tare.

Answ. 74—0— 5¼ Nett Wt.

The Tare in the last Example is to be found by the foregoing Directions, 10 *C.* 2 *qrs.* 8*lb.*$\frac{3}{4}$, which subtracted as in the Work, leaves 74 *C.* 0 *qrs.* 5*lb*$\frac{1}{4}$ for the Nett Wt.

But the foregoing Example may be sooner done by *Practice*, thus:

	C.	*qrs.*	*lb.*	
14*lb.* is $\frac{1}{8}$ of *C.*	84	2	14	Gross.
Sub.	10	2	8$\frac{3}{4}$	Tare.
	74	0	5$\frac{1}{4}$	Nett.

In this Method the Gross Weight is divided by 8, because 14*lb.* is one Eighth of 112*lb.* and the Remainder is reduced into the next inferior Name, and still divided by 8 to the End, and then deducted as above, and the Nett Weight is the same as by the other Way. And so may any Tare *per Cwt.* be found, if the Tare be an even Part of 112*lb.* as 14 is one Eighth, and 7*lb.* is the Half of that, *&c.* that is, if the Tare be at 7*lb. per C.* find it for 14*lb.* as before: and then take the Half of that for 7*lb. per C.* Tare, the like for 8*lb. per C.* Tare; take one Seventh for 16*lb.* and then the Half of that for 8*lb. per C.* Tare.

Of TRETT.

What *Trett* is when allowed, and how found, hath been said already; now I shall give an Example for Explanation, as follows:

Bought six Hogsheads of Tobacco, containing Gross and Tare as follows, viz.

No.		*C.*	*qrs.*	*lb.*		*lb.*
1	wt.	4	1	20	*Tare.*	80
2		5	2	19		100
3		6	3	18		102
4		7	3	12		104
5		8	2	13		106
6		9	1	14		110
		42	3	12		602

Suttle		
26)4198(161 *lb.* Trett		
26		4
159		171
156		28
38		1380
26		342
12		4800 Pounds Gross.
16	Subtract	602 Pounds Tare.
26)192(7 oz.		4198 Pounds Suttle.
182	Deduct	161 7 Pounds Trett.
10		4036 9 Pounds Nett.

There are some few other Rules, such as Barter, or exchanging Goods for Goods; also Exchange for Coin, Profit, Loss, &c. but these being done either by the Rule of Three, or by the Rules of Practice, it is unnecessary to enlarge upon them in this Place.

Of FRACTIONS *Vulgar and Decimal.*

A FRACTION is an Expression for a Part or Parts of an Unit.

A VULGAR FRACTION is written with two Figures, or Numbers one above another, and a short Line drawn between them. The *lower* Number is called the Denominator, and this shews in how many equal Parts the Unit is supposed to be divided. The *higher* Number is the Numerator, which shews how many of those Parts are meant by the Fraction. Thus if I want to express 7*d.* as Part of a Shilling, I write $\frac{7}{12}$. The Denominator 12 shews the Number of Pence in a Shilling, and the Numerator 7 is the Number given. If I would express 13 Shillings as a Part of a *l.* I write $\frac{13}{20}$: or 35*lb.* as Part of a Hundred Weight, I write $\frac{35}{112}$, because in the first Case 20 Shillings make a Pound, and in the second 112*lb.* make a *Cwt.*

Fractions are thus set down and read, *viz.* $\frac{1}{4}$, one Fourth; $\frac{1}{2}$, one Half; $\frac{1}{3}$, one Third; $\frac{1}{5}$, one Fifth; $\frac{1}{6}$, one Sixth; $\frac{2}{3}$, two thirds; $\frac{2}{4}$, two Fourths; $\frac{5}{6}$, five Sixths; $\frac{5}{7}$, five Sevenths, *&c.*

Fractions are either proper or improper: A *proper* Fraction hath its Numerator *less* than the Denominator, as $\frac{5}{8}$, five Eighths; $\frac{24}{56}$; Twenty-four Fifty-sixths, *&c.*

An *improper* Fraction hath its Numerator *greater* than the Denominator; $\frac{7}{3}$, seven Thirds; $\frac{48}{15}$, Forty-eight Fifteenths, *&c.*

Again, Fractions are either Simple or Compound; Simple, when a Part of an Unit or Integer or Thing hath but one Numerator, and one Denominator; as $\frac{3}{4}$ of a Pound Sterling, $\frac{1}{2}$ of *C.* Weight, $\frac{2}{3}$ of a Tun, $\frac{5}{6}$ of a Gallon, *&c.* Compound is a Fraction of a Fraction, as the $\frac{1}{2}$ of a $\frac{1}{4}$ of a Pound Sterling, which is equal to Half a Crown; or when one is divided into any Number of Parts, and those Parts again subdivided into Parts, *&c.*

Fractions are of two Kinds, viz. *Vulgar* and *Decimal*. *Vulgar* Fractions are as declared before. *Decimal* Fractions are artificially expressed, by setting down the Numerators, only, the Denominators being understood; and are always an Unit, with as many Cyphers annexed as there are Places in the Numerator; and therefore may be either 10, or some Power of 10, as 100, 1000, 10,000, or 100,000, *&c.*

Decimal Fractions appear, and are worked as whole Numbers, but are distinguished from them by a Point or Comma prefixed thus; ,5 is read five Tenths; ,32 thirty-two Hundredths; and ,256 two hundred fifty-six Thousandths; but of *Decimal* Fractions, and their Use, hereafter.

REDUCTION *of Vulgar Fractions,* is to prepare them for *Addition, Subtraction,* &c.

1. *To reduce a mixed Number to an improper Fraction.*

Rule.

Multiply the Integer by the Denominator, and take in the Numerator.

Example.

Reduce 12 Gallons $\frac{3}{4}$ to an improper Fraction, thus:

$$\begin{array}{l} 4 \\ \hline 51 \text{ New Numerator.} \\ \hline \end{array}$$

Answer $\frac{51}{4}$, or 51 Quarts.

2. *To reduce an improper Fraction to a whole or mixt Number.*

Rule. Divide the Numerator by the Denominator.

Example.

Reduce the last Example to a whole or mixt Number, *viz.*

$$\frac{51}{4} \qquad \begin{array}{l} 4)\ 51 \\ \hline 12\text{—}3 \text{ remainder equal to } \frac{3}{4} \\ \hline \end{array}$$

Here 12 Gallons is the whole Number, $\frac{3}{4}$ the Fraction, the same with three Quarts.

3. *To reduce Fractions to a common Denominator.*

Rule. Multiply the Numerator of each Fraction into all the Denominators except its own, and the Product will be a Numerator to that Fraction; and then do so by the others: The common Denominator is found by multiplying all the Denominators together.

Ex. Reduce $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$ of any Integer, to a common Denominator; say twice 4 is 8, and 6 Times 8 is 48, for a new Numerator to $\frac{2}{3}$; then say 3 Times 3 is 9, and 6 Times 9 is 54, for a new Numerator to $\frac{3}{4}$; lastly, say, 5 Times 4 is 20, and 3 Times 20 is 60, the Numerator to $\frac{5}{6}$: Then to find the common Denominator, say 3 Times 4 is 12, and 6 Times

12 is 72, the common Denominator; so that $\frac{48}{72}$ is equal to $\frac{2}{3}$, $\frac{54}{72}$ is equal to $\frac{3}{4}$, and $\frac{60}{72}$ is equal to $\frac{5}{6}$. Which may be thus proved:

$\frac{2}{3}$ of a Pound is	13	4	48	72) 162 ($2\frac{18}{72}$ or $2\frac{1}{4}$
$\frac{3}{4}$ ditto	15	0	54	144
$\frac{5}{6}$ ditto	16	8	60	
				18
But $2l.\frac{1}{4} = 2l. 5s.$ or	45	0	$\frac{162}{72}$ Common Denominator.	

Here the several Numerators are added together, and they make 162; which placed over the common Denominator 72, make the improper Fraction $\frac{162}{72}$; and its Value is found as before directed, *in the Rule for reducing an improper Fraction to a whole or mixt Number*; as may be seen in the foregoing Page.

4. *To reduce a Fraction into its lowest Terms.*

Rule. If they are even Numbers, take half of the Numerator and Denominator, as long as you can; and then divide them by any digit Number *(i. e.* 3, 4, 5, 6, *&c.)* that will leave no Remainder in either.

Ex. Reduce $\frac{56}{84}$ into its lowest Terms; say the half of 56 is 28, and the $\frac{1}{2}$ of 84 is 42; and then the half of 28 is 14, and the $\frac{1}{2}$ of 42 is 21: So the Fraction $\frac{56}{84}$ is reduced to $\frac{14}{21}$. And since they cannot be halved any longer, for though you can halve 14, yet you cannot 21, without Remainder; try therefore to divide them by some other digit Number; and you will find, that 7 will divide both Numerator and Denominator without any Remainder; then say the 7's in 14 twice, and the 7's in 21, three Times: So the Fraction $\frac{56}{84}$ reduced into its lowest Terms, will be $\frac{2}{3}$; which is of the same Value as $\frac{56}{84}$. The Work is done in this Form.

2	2	7	
56	28	14	2
84	42	21	3

And the Proof that $\frac{2}{3}$ is of the same Value with $\frac{56}{84}$ will appear by multiplying any Integer by the Numerator of each Fraction, and dividing by the Denominator of each Fraction.

Ex. Let the Integer be 1*l.* Sterling, or 20*s.*

The Fraction $\frac{2}{3}$

```
 s.
 20
  2
----
3)40
----
 13---4d.
 -------
```

The Fraction $\frac{56}{84}$

```
     s.
     20
     56
  --------
  84)1120(13s.
     84
  --------
     280
     252
    -----
      28
      12
    -----
     336(4d.
     336
    -----
     (0)
```

13*s.* 4*d.*

Here it is manifest, that by working by a Fraction in its lowest Terms, much Time and Figures are saved. In one Operation, 20 the Integer is multiplied by 2, and the Product 40 divided by 3, and there remains 1, or $\frac{1}{3}$ of a Shilling, or a Groat, as in the other Work.

There are other Methods of reducing a Fraction into its lowest Terms; but none so ready as the foregoing, where it can be used.

5. *To reduce a Compound Fraction into a simple one of the same Value.*

Rule. Multiply the Numerators together for a new Numerator, and the Denominators together for a new Denominator.

Ex. Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$ of a Pound Sterling into a simple Fraction. Say twice 3 is 6, and 5 Times 6 is 30, the Numerator; then three Times 4 is 12, and 6 Times 12 is 72, the Denominator: So $\frac{30}{72}$ of a Pound is equivalent to $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$ of a *l.* Thus proved, $\frac{5}{6}$ of a *l.* 16*s.* 8*d.* and $\frac{3}{4}$ of 16*s.* 8*d.* is 12*s.* 6*d.* and $\frac{2}{3}$ of 12*s.* 6*d.* is 8*s.* 4*d.* the Answer. And multiplying 20*s* by 30, and dividing by 72, gives the same Answer, as in the following Work is plain.

20
30
72)600(8*s.*
576
24 Remains } 8*s.* 4*d.*
12 Multiply
72)288(4*d.*
288
(0)

6. *To find the Value of any Fraction, whether of Coin, Weight, or Measure.*

Rule. Multiply the Integer by the Numerator, and divide by the Denominator; and if any Thing remains, multiply it by the Number of Units of the next inferior Denomination.

Ex. 1. What is $\frac{30}{72}$ of a Pound, or 20*s.*? The Operation of the foregoing Example of Proof to the Compound Fraction $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$, answers this Question, and need not be repeated.

Ex. 2. What is the amount of $\frac{5}{6}$ of a Ton Weight?

20 Integer.
5 Numerator.
Denominator 6)100
16 2 18 $10\frac{4}{6}$

	C.	*qrs.*	*lb.*	*oz.*
Answ.	16	2	18	$10\frac{4}{6}$

Here the Integer 20 *C.* is multiplied by the Numerator 5; and the Product 100 divided by the Denominator 6, and the Remainder 4 is multiplied by the Parts of the next inferior Denomination, &c. and the Answer is 16 *C.* 2 *qrs.* 18*lb.* 10*oz.* $\frac{4}{6}$, or $\frac{2}{3}$ of an Ounce Weight, as in the Work.

Addition of Vulgar Fractions.

IF the Fractions to be added have a common Denominator, add the Numerators together for a Numerator, and place it over the common Denominator, and the Thing is done.

Ex. Add $\frac{2}{5}$ $\frac{3}{5}$, and $\frac{4}{5}$ of a Pound Sterling together. Say 2 and 3 is 5, and 4 is 9, the Numerator; which place over 5 the common Denominator, thus $\frac{9}{5}$, and this improper Fraction $\frac{9}{5}$, is in Value 36*s.* for 9 Times 4*s.* (the 5th of a Pound) is 36*s.* for if the Number 9 be divided by the Denominator 5, I say the 5's in 9*l.* once, and 4 remains, which is $\frac{4}{5}$ of a Pound, or 16*s.*

$$\begin{array}{r} 5)9 \\ \hline 1\frac{4}{5} \end{array}$$

But if the Fractions to be added have unequal Denominators, they must be first reduced to a common Denominator, by the Rule before shewn, before Addition can be made; and then proceed as above.

2. When mixed Numbers are to be added, work with the fractional Parts as before, and carry the fractional Value to the whole Numbers.

Example.

Add 25*l.* $\frac{3}{4}$ to 12 $\frac{1}{4}$, thus

$$\begin{array}{r} 25\frac{3}{4} \\ 12\frac{1}{4} \\ \hline \end{array}$$

l. 38 *Answer.*

Here 1 and 3, the Numerators, make 4; and $\frac{4}{4}$ is 1, and 2 is 3, and 5 makes 8; and 1 and 2 is 3, and the Answer is 38.

Or they may be reduced to improper Fractions thus:

$$\begin{array}{ccc} 25\frac{3}{4} & 12\frac{1}{4} & \ 103 \\ 4 & 4 & \ 49 \\ \hline 103 & 49 & 4)\ 152 \\ \hline 4 & 4 & 38 \text{ Pounds.} \end{array}$$

Here the Numerators are added, and their Total is 152; which divided by 4, the common Denominator, quotes 38 Pounds, the same Answer as above.

3. When compound Fractions are to be added to simple ones, reduce the compound Fraction to a simple one, as before directed; and then proceed as above.

Ex. 1. Add $\frac{2}{3}$ and $\frac{3}{8}$ to $\frac{1}{2}$ of $\frac{2}{4}$ of a Pound, thus once 2 is 2, and twice 4 is 8, therefore $\frac{2}{8}$ is equal to the compound Fraction. Then add, saying, 2 and 3 is 5, and 2 is 7, the new

Numerator, and $\frac{7}{8}$, equal in Value to 17*s.* 6*d.* will be the Answer.

Ex. 2. Add $\frac{3}{8}$ to $\frac{3}{4}$ of $\frac{1}{3}$ of a Shilling. The work will be $\frac{3}{8}$ added to $\frac{3}{12}$, but these must be brought to a common Denominator, and the Fractions will then be $\frac{36}{96}$ added $\frac{24}{96}$, which will be $\frac{60}{96}$, or when brought to the lowest Terms $\frac{5}{8}$ of a Shilling; the eight of a Shilling is 1*d*$\frac{1}{2}$. therefore $\frac{5}{8}$ is 7*d*$\frac{1}{2}$.

That this Answer is right is thus proved: I am to add $\frac{3}{8}$ of a Shilling, or 4*d.*$\frac{1}{2}$ to $\frac{3}{4}$ of $\frac{1}{3}$ of a Shilling, now the third o a Shilling is 4*d.* and $\frac{3}{4}$ of 4*d.* must be 3*d.* of course 4*d* $\frac{1}{2}$ added to 3*d.* gives 7*d.*$\frac{1}{2}$ according to the Answer found above.

Subtraction of Vulgar Fractions.

IN this Rule the Fractions must have a common Denominator, or be reduced to one, before Deduction can be made.

Ex. What is the Difference between $\frac{1}{4}$ and $\frac{3}{4}$? Answer $\frac{2}{4}$; which may be proved by Addition, for $\frac{1}{4}$ and $\frac{2}{4}$ make $\frac{3}{4}$.

Note. The Difference between the Numerators is th Difference of the Fractions.

Again from $\frac{3}{4}$ of a Pound take $\frac{5}{12}$: Here the Fraction are to be reduced to a common Denominator; 36 is the firs Numerator, and 20 the second Numerator, their Differenc is 16; and 48 is the common Denominator: So that $\frac{16}{48}$ o $\frac{1}{3}$, in its lowest Terms, is the Difference between $\frac{3}{4}$ of Pound, and $\frac{5}{12}$ of a Pound.

To subtract a compound Fraction from a simple one.

Rule, Reduce the compound Fraction to a simple one and then work as before.

Ex. From $\frac{13}{14}$ take $\frac{2}{3}$ of $\frac{8}{9}$, say twice 8 is 16, and 3 Times is 27, therefore $\frac{16}{27}$, is equal to a compound Fraction. The the $\frac{13}{14}$ and $\frac{16}{27}$ must be reduced to a common Denominat thus: 13 Times 27 is 351, the first Numerator; 16 Time 14 is 224, the second Numerator; and 14 Times 27 378 the common Denominator. Subtract 224 the secon Numerator, from 351 the first Numerator, and the Remain der is 127, which place over 378, the common Denomina tor, thus $\frac{127}{378}$ *Answer.*

When a simple Fraction is to be deducted from a whole Numbe

Rule, Subtract the Numerator of the Fraction from th Den

Denominator, and place the Remainder over the Denominator, and carry 1 to subtract from the whole Number, &c.

Example.

From 12*l.* take $\frac{5}{8}$ of a Pound thus: Say 5 (the Numerator) from 8 (the Denominator) and there remains 3, which place over the Denominator 8, thus $\frac{3}{8}$; then 1 from 12 and there remains 11. So the Answer is, *l.* 11 $\frac{3}{8}$, or *l.* 11 7 6.

Multiplication of Vulgar Fractions.

Rule—MULTIPLY the Numerators into one another for the Numerator of the Product; and then do the same by the Denominators, for the Denominator of the Product.

Ex. Multiply $\frac{3}{4}$ of a Pound by $\frac{5}{6}$ of ditto: say 3 Times 5 is 15, the Numerator; and 4 Times 6 is 24, the Denominator: So the Answer is $\frac{15}{24}$, or in the lowest Term $\frac{5}{8}$.

You are to observe, That Multiplication in Fractions lessens the Product, though in whole Numbers it augments it; as above $\frac{5}{8}$, or 12*s.* 6*d.* is less than $\frac{5}{6}$, or 16*s.* 8*d.* and also less than the other Fraction $\frac{3}{4}$, or 15*s.*

2. *To multiply a whole Number by a Fraction.*

Rule. Multiply the Integer by the Numerator of the Fraction, and place the Product over the Denominator.

Note, Multiplication by a Fraction, implies the taking away some Part or Parts of the Multiplicand, and therefore, may be truly expressed by a Compound Fraction. Thus $\frac{1}{5}$ multiplied by $\frac{3}{4}$, is the same as $\frac{1}{2}$ of $\frac{3}{4}$ or $\frac{3}{5}$: and therefore though the Rule is called Multiplication, it produces contrary Effects from Multiplication in whole Numbers.

Example.

Multiply 56*l.* by $\frac{3}{4}$.

$$\begin{array}{r} 56 \\ 3 \\ \hline 168 \\ \hline 4 \end{array} \Big\} \textit{Facit.}$$

This improper Fraction $\frac{168}{4}$ reduced according to Rule, makes but 42*l.* which is less than 56: and confirms what has been asserted, *viz.* that Multiplication of Fractions lessens the Product, &c.

To multiply a Simple by a Compound Fraction.

Rule, Reduce the Compound Fraction to a simple one, according to the foregoing Rules, and work as above.

Ex. Multiply $\frac{6}{8}$ of a Pound, by $\frac{2}{3}$ of $\frac{3}{4}$ of a Pound: say 6 Times 6 is 36, and 8 Times 12 is 96. So that the Answer is $\frac{36}{96}$, or $\frac{3}{8}$ in its lowest Terms; equal to 7*s.* 6*d.*

Division of Vulgar Fractions.

Rule—MULTIPLY the Numerator of the Divisor into the Denominator of the Dividend, and the Product is the Denominator of the Quotient; and then multiply the Denominator of the Divisor into the Numerator of the Dividend, and the Product will be the Numerator of the Quotient.

Ex. Divide $\frac{15}{16}$ by $\frac{2}{3}$. The Work will stand thus:

$\frac{2}{3})\frac{15}{16}(\frac{45}{32}$ Quotient.

Here 16, multiplied by 2, gives 32; and 15 by 3, gives 45: So that the Quotient is $\frac{45}{32}$ equal to 1 $\frac{13}{32}$, as in the work.

Again, suppose $\frac{24}{36}$ was divided by $\frac{2}{3}$, the Quotient will be $\frac{72}{72}$, equal to 1 Integer, or whole thing. And so for any other Example.

Reduction of DECIMAL FRACTIONS.

What a *Decimal Fraction* is, has been already shewn. The next step is, how to reduce a Vulgar Fraction into a Decimal: which is no more than to annex Cyphers at Discretion (that is 2, 3, or 4, *&c.*) to the Numerator, and then divide it by the Denominator.

Example 1.

Reduce $\frac{3}{4}$ of a Pound Sterling to a Decimal.

4)3,00 }
——— } that is, 75 hundredths, equal to 3 qrs. of any
,75 } thing, whether Money, Weight, Measure, *&c.*

as being $\frac{3}{4}$, and is written 75 of 100; and so 25 hundredths is, in Decimals, the Quarter of any thing, as being the $\frac{1}{4}$ of a 100; and is expressed ,25; and five tenths expresses the half of any thing, as being the $\frac{1}{2}$ of 10, and is expressed, ,5.

In Reduction of Decimals it sometimes happens that a Cypher or Cyphers, must be placed on the *left* Hand of the

Decimal, to supply the Defect of the Want of Places in the Quotient of Division. In this Case always remember that so many Cyphers as you *annex* to the Denominator of the Vulgar Fraction, so many Places you must point off in the Quotient towards the left Hand; but if there be not so many Places to point off, then you must supply the Defect by placing a Cypher or Cyphers to the left of the Decimal.

Ex. 2. Reduce 9*d*. or $\frac{9}{12}$ to the Decimal of a Shilling, thus:

```
12)9,00     equal to ,75 or 75 hundredths of
-------     a Shilling or to 9d.
    ,75
```

Ex. 3. Reduce 9*d*. to the Decimal of a Pound Sterling.

In this Case the Denominator of the Fraction will be 240, because 240 Pence make a Pound: therefore the Work will stand thus:

```
240)9,0000(,0375
    720
    ----
    1800
    1680
    ----
     1200
     1200
     ----
     ....
```

Here are but three Places in the Quotient, *viz.* 375; and therefore I cannot point off 4 for the four Cyphers annexed to 9; wherefore I prefix 0 to the left of the Quotient 375, thus, ,0375, and then it is 375 ten thousand Parts of an Integer; and in Vulgar Fractions it would stand $\frac{375}{10000}$.

The more Cyphers you annex, when the Answer is not exact, the nearer you bring your Decimal to the Truth; in most Cases, however, four Cyphers annexed are sufficient. But when you are to reduce $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ (as above) of an Integer to a Decimal, or any Number of Shillings to a Decimal of a Pound, two Cyphers are sufficient. One Example more.

Ex. 4. Reduce 3 Farthings to the Decimal of a Pound, that is the Vulgar Fraction $\frac{3}{960}$ Farthings in a Pound.

96 | 0)3,0000 | 0(,003125. The Work being performed according to the Division, with two Cyphers prefixed, quotes ,003125, or 3125 Ten Hundred Thousandth Parts of a Pound: and in Vulgar Fractions it would stand thus: $\frac{3125}{1000000}$.

Ex. 5. How is 12 Pounds Weight expressed in the Decimal of 1 *C*. Weight *Avoirdupois*, or 112*lb*? The Vulgar Fraction is $\frac{12}{112}$, and the Decimal ,1071 found as before, thus:

112)12,0000(,1071
112
——
80, &c.

The Remainder, 48, is not worth Notice, being less than the 100000 part of a Unit, or 1.

Ex. 6. How is 73 Days brought to the Decimal of a Year? Vulgarly thus expressed $\frac{73}{365}$.

365)730(,2 *Ans.* 2 tenths or ,2.
730
——
(0)

Thus proved
36,5
36,5
——
73
——

Here 365, the Days in a Year, are divided by 10, twice, and the Quotients added together make 73 Days.

Valuation of Decimals.

TO find the Value of a Decimal Fraction whether of Corn, Weight, Measure, &c.

Rule, Multiply the Decimal given, by the Units contained in the next inferior Denomination, and point off as many Places from the Right-hand as you have in your Decimal; those Figures towards the left of the Point are Integers, or whole Numbers; and those on the other Side, towards the Right-hand, are Parts of 1, or Unity; that is, so many Tenths, Hundredths, Thousandths, or Ten Thousandths, of one of those Integers, whether a Pound, a Shilling, or a Penny, &c. of a Ton, a Hundred, a Quarter, or a Pound Weight, &c. And so many of any other Integer, of what Quality or Kind soever.

Examples.

,476 Parts of a Pound Sterling.
20 Shillings a Pound.
——
9,520
12 Pence one Shilling.
——
6,240 *Answer* 9*s.* 6*d.* ,240

,476 Parts of a Ton Wt.
20 *C.* 1 Ton.
———
9,520
4 *qrs.* 1 *C.*
———
2,080
28 *lb.* 1 *qr.* of a *C.*
Answer
9 *C.* 2 *qrs.* 2 *lb.* 240 Parts ———
2,240
———

In the Example of Money, I multiply the Fraction by 20, and point off 520 for the three places in the Decimal, *&c.* and the Answer is 9*s.* 6*d.* and 240 over, or $\frac{240}{1000}$, which is nearly equal to a Farthing.

In the Example of Weight, I proceed as in that of Money, but with different Respect to the inferior Denominations, and the Answer is 9 *C.* 2 *qrs.* 2 *lb.* $\frac{240}{1000}$ of a Pound wt.

To find the Value of a Decimal in Money by a shorter Method, *viz.*

Rule, Always account the double of the first Figure (to the Left-hand) for Shillings; and if the next to it is 5, reckon one Shilling more: and whatever is above 5, call every one Ten; and the next Figure so many ones as it contains; which Tens and Ones call Farthings; and for every 24, abate one. As admit the last Example of Money, *viz.* 476; the double of 4 is 8, and there being one 5 in 7, (the next Figure) I reckon 1*s.* more, which makes 9*s.* and there being 2 (in the 7) above 5, they are to be accounted two Tens, or 20; which with the next Figure 6 being so many Ones, making 26 Farthings; and abating 1 for 24, they give 6*d.* and a Farthing more.

Addition of Decimals

IS the same in Practice as in whole Numbers; only in setting down, Care must be taken that the Decimal Parts stand respectively under like Parts; that is, Primes under Primes, Seconds under Seconds, Thirds under Thirds, *&c.* and the Integers stand as in whole Numbers.

Example.

Integers. Primes Seconds Thirds	Parts	Primes Seconds Thirds Fourths Fifths
246,426	,4796	,47962
74,42	,42	,0642
9,06	,076	,006
65,794	,0004	,7
42,005	,5	,9
437,705	1,4760	2,14982

Note, *There must be as many Places pointed off, as there are in that Number which has most Decimal Places.*

The casting up of the foregoing Examples is the same with Addition of one Denomination, in whole Numbers. The Total of the first (supposing them Pounds Sterling) is 437*l.* and ,705 Parts. The second is 1*l*, and ,4760 Parts. And the third is 2*l.* and ,14982 Parts.

Subtraction of Decimals.

THE Numbers must be placed as before in *Addition*, and then proceed as in *Subtraction of Numbers of one Denomination*.

l. pts.	*l. pts.*	*l. pts.*
46,51	144,42	4762,0
9,24	91,7462	0,472
37,27	48,6738	4761,528

Multiplication of Decimals.

Here the placing the Numbers, and the Operation is the very same as in the whole Numbers; remember only to point off, towards the Right-hand, so many Places for Decimals, as you have Decimal Places in both *Multiplicand* and *Multiplier*.

Examples.

(1)	(2)	(3)
24,6	4602	,2796
2,5	,075	26
1230	23010	16776
492	32214	5592
61,50	345,150	7,2696

(4)	(5)	(6)
,07214	,083	4,25
,006	,16	1,09
,00043284	498	3825
	083	4250
	,01328	4,6325

Note, That when there are not a competent Number of Figures, or Places to point off, such Defect is supplied with Cyphers, to the Left-hand; as in the 4th and 5th Examples according to what was before hinted in reducing a Vulgar Fraction to a Decimal.

Division of Decimals

IS the same in Operation as in whole Numbers: the only Difficulty is to know how many Decimal Places to point off, towards the Left-hand of the Quotient, to which End, remember this Rule; observe how many Decimal Places there are, both in the Divisor and in the Dividend, and find the Difference; and whatsoever it is, so many Places must be pointed off to the Right-hand of the Quotient.

Ex. Divide 12,345670 by 6,789 and the work stands as follows:

```
6,789)12,345670(1,818 Answ.
      6,789 ...
      -----
      55566
      54312
      -------
       12547
        6789
        -------
        57580
        54312
        -------
         3268
```

In this Example, the Dividend hath three Decimal Places more than the Divisor, wherefore I point off three Places to the Right-Hand of the Quotient, *viz.* 818; so the Quotient is 1 Integer, and ,818 Parts.

Ex. 2. Divide 3,46000 by 1,23:

```
1,23)3,46000(2,813
       246 ...
       -----
       1000
        984
        -----
         160
         123
         -----
          370
          369
          -----
          (1)
```

Here the Difference between the Decimal Places in the Divisor and Dividend is three Places; as in the foregoing Example; therefore 813 is pointed off for the Decimal Fraction; and the Quotient is 3 Integers, and ,813 Thousandths of an Integer.

The Reader who has attended thus far, is recommended to look back from the Beginning, he will now find no Difficulty, but much Satisfaction and Pleasure in treading over the same Ground again, and in amusing himself by working other Examples which he may readily devise under every Rule.

BOOK-KEEPING.

BOOK-KEEPING is the Art of recording Mercantile Transactions in a regular and systematic Manner.

A Merchant's Books should exhibit the true State of his

Affairs. They should shew at first Sight, as it were, the particular Success of each Transaction, and exhibit also the general Result of the Whole: and they should be so arranged as to afford correct and ready Information upon every Subject for which they may be consulted.

Books may be kept either by *single* or *double Entry*.

Single Entry is chiefly used in Retail Business; it is the most concise and simple Method of Book-keeping; but not the most perfect.

Double Entry is generally used in Wholesale and Mercantile Affairs, whence it is usually called by way of pre-eminence *Merchant's Accounts*. Of these we have now to give an Account: and it is not without good Reason, that most People of Business and Ingenuity are desirous to be Masters of this Art; for if we consider the satisfaction that naturally ariseth from an Accompt well kept; the Pleasure that accrues to a Person by seeing what he gains, by such Species of Goods he deals in, and his whole Profit by a Year's Trade; and thereby also, to know the true State of his Affairs and Circumstances, so that he may, according to Discretion, retrench or enlarge his Expences, &c. as he shall think fit.

The Books of principal Use in the business of Double Entry are the *Waste Book*, (by some called the *Memorial*) *Journal*, and *Ledger*.

Waste Book.

IN this Book must be daily written in the Order of Time, in which it happens, whatever occurs in the Way of Trade; Buying, Selling, Receiving, Delivering, Bargaining, Shipping, &c. without Omission of any one Thing either Bought or Sold, Borrowed, &c.

The *Waste Book* is ruled with one Marginal Line, and three Lines for Pounds, Shillings, and Pence, and the Day of the Month, and the Year of our Lord, is inserted in the Middle of the Page. In this Book any One may write, and on Occasion, any thing may be blotted out, if not well entered, or any Error be made.

JOURNAL.

INTO this Book every article is brought out of the *Waste Book*, but in other Terms, in a better Style, and in a fairer Hand, without any Alteration of Cyphers or Figures;

and every Parcel, one after another, are promiscuously set without Intermission, to make the Book, or several Entries of it, of more Credit and Validity in case of any Law Dispute, or any other Controversy that may happen between Merchant and Merchant. In this Book you are to distinguish the Debtor and Creditor (or in other Terms, the *Debts* and *Credits.)* And to this Book you must have Recourse for the Particulars of an Account which in the Ledger are entered in one Line. In this Book also, the Day of the Month is usually placed in the Middle of the Page: it is ruled with double Marginal Lines, for Reference to the Ledger; and with three Lines for *l. s. d.* as the Waste Book.

Of the Ledger.

FROM the *Journal* or *Day Book,* all Matters or Things are posted into the Ledger, which by the *Spaniards* is called *El Libro Grande,* as being the biggest Book, or chief of Accounts. The Left-hand Side of this Book is called the *Debtor,* and the Right the *Creditor* Side; and the *Numbers* or *Folios* of each Side must be alike, as 45 *Debtor,* and also 45 *Creditor.* The Day of the Month (in this Book) is set in a narrow Column on the Left-hand, and the Month on the Left of that: But where I kept Books, the Number in the narrow Column referred to the Journal Page, and the Month and Day were placed in the broad Column, to the Right of hat; and at the Head of each Folio is the Name of the Place of Residence, and the Year of our Lord; as thus:

London, Anno..............................1805.

But the Example of these several Books hereafter following, will make the foregoing Hints of them much more intelligible. The following is a general Rule, upon which most of the Entries in Book-keeping depend, viz.

All things Received, or the Receivers, are Debtors to the Delivered, or the Deliverer.

	Waste Book Entry	*l.*	*s.*	*d.*
	Bought of *William Wilkins*, of *Norton Falgate*, 120 Yards of white Sarsenet, at 2*s*. 3*d*. per Yard, to pay in two Months	13	10	—
1 — 2	*The Journal Entry of the same.* Wrought Silk, Debtor to *William Wilkins*, *l.* 13—10 for 120 Yards of White Sarsenet, at 2*s*. 3*d*. *per* Yard to pay in two Months. - - - - -	13	10	—
	In this Example the Wrought Silks are received, and therefore Debtor to William Wilkins *the Deliverer.*			
	Again, *Waste-Book Entry.* *January* 4 Sold *Henry Harrington* 246*lb*. nett of Indigo, at 6*s*. 6*d*. *per* lb. to pay in 3 Months.	79	19	—
3 — 4	*Journal Entry.* *Henry Harrington* Dr. to Indigo, for 246lb. nett, at 6*s*. 6*d*. *per* lb. to pay in 3 Months - - - . -	79	19	—
	Once more, *Waste-Book Entry.* Bought of *George Goodinch*, Sen. *viz.* *Chesh.* Cheese 430 C. ½, at 23*s*. 4*d*. *per* C. *l.* 502—5 Butter, 50 Firkihs, qt. neat 2800lb. at 3*d*. *per* lb. 35—0 to pay at 6 Months - - -	537	05	—
5 — 4 5	*Journal Entry.* Sundry Accounts, Cr. to *George Goodinch*, *l.* 537—05——— *Cheshire* Cheese, for 430 C. ½, at 23*s*. 4*d*. *per* C. *l.* 502—5 Butter, for 50 Firkins, qt. nett 2800lb. at 3*d*. *per* lb. to pay in 6 Months. 35—0	537	05	—

Waste-Book.

Sold to *James Jenkins*, viz.				
White Sarsenet 50 Yards at 3s. *per* Yard - -	7—10 0			
Indigo 50 Pounds, at 7*s.* *per* Pound - -	17—10—0			
		25	—	—

Journal Entry of the last.

6 —	*James Jenkins* Debtor to sundry Accounts, *viz.*				
7	To white Sarsenet for 50 Yards, at 3*s.* *per* Yard - -	*l.* 7—10—0			
8	To Indigo for 50 lb. at 7*s.* *per* lb. - -	17—10—0			
			25	—	—

From these few Examples of Entry, it may be observed, that an experienced Person in Accompts, and a good Writer, may keep a *Journal* without a *Waste-Book* or a *Waste-Book* without a *Journal*, since they both import one and the same Thing, though they differ a little in Words, or expression.

But however, I shall give Methods of keeping each, as far as Room will give me Leave.

(1)

The Waste Book.

London, January 1*st*——— 1805.

An Inventory of all the Money, Goods, and Debts, belonging to me A. B. *of* London, *Merchant*, viz.

In cash - - -	3500— —			
In Tobacco 4726 lb. at 9*d.* *per* lb.	177 4 6			
In Broadcloth 6 Pieces, at 50*s.* *per* Piece -	15 — —			
Dowlas 1000 Ells, at 2*s.* 4*d.* *per* Ell,	116 13 4			
Canary Wines 9 Pipes, at 30*l.* *per* Pipe -	270 — —			
Due to me from *Henry Bland*, *per* Bond -	60 — —			
		4138	17	10

(1)

		Journal, *Inventory, &c.*				l.	s.	d.
		Sundry Accts. Dr. to Stock—4138 17 10 *viz.*						
1	1	Cash	3500	—	—			
—		Tobacco for 4726lb. at 9*d. per* lb.	177	4	6			
	1	Broadcloths for 6 Pieces, at 50*s. per* Piece.	15	—	—			
		Dowlas for 1000 Ells, at 2*s.* 4*d. per* Ell	163	13	4			
	1	Canary Wines for 9 Pipes at 30*l. per* Pipe	270	—	—			
	3	*Henry Bland* due on Bond	60	—	—			
						4138	17	10

I shall make one Page serve for Waste Book and Journal Entries, to save Room, and also to have both Methods of Entry under Eye, to make them more intelligibly useful to the Reader, he hereby being not obliged to turn over Leaf to see their Difference of Entry.

Waste Book.

					l.	s.	d.
	London, Januaay 1*st.*——1805.						
	Owing to *William Webb,* by Note of Hand -	50	—	—			
	Ditto to *Roger Ruff,* the Balance of his Account - -	16	12	4			
	Ditto to *Henry Hern* due the 4th of *May* next - -	62	—	—			
					128	12	4
	Journal.						
1	Stock Debtor to Sundry Accounts,						
—	*l.* 128 12 4 *viz.*						
3	To *William Webb* by Note of my Hand - -	50	—	—			
5	To *Roger Ruff,* for the Balance of his Account - -	16	12	4			
:	To *Henry Hern,* due the 4th of *May* next.	62	—	—	128	12	4

Waste Book.

	London, Feb. 2d. ——— 1805.				
	Sold *Thomas Townshend, viz.*		*l.*	*s.*	
	246 *lb.* of *Virginia* Cut Tobacco, at 14*d. per* lb.	14 7 —			
	460 Ells of Dowlas, at 3*s. per* Ell - - -	69 — —			
			83	7	—
	Feb. 2. *Journal.*				
6 —	*Thomas Townshend,* Debtor to Sundries, *viz.*				
1	To Tobacco, for 246 *lb.* at 14*d. per* lb.	14 7 —			
2	To Dowlas, for 460 Ells, at 3*s. per* Ell - -	69 — —			
			83	7	—
	Waste Book. Ditto 24th.				
	Bought of *Leonard Legg,* four Pipes of Canary, at 28*l.* Pipe - - - - To pay in 6 Months.		112	—	—
	Ditto 24th. *Journal.*				
1 — 2	Canary Wines, Debtor to *Leonard Legg* for 4 Pipes, at 28 Pounds *per* Pipe ——— To pay in 6 Months.		112	—	—

The short Lines ruled against the Journal Entries are, or may be, termed Posting Lines, and the Figure on the Top of the Lines denotes the Folio of the Ledger where the Debtor is entered; and the Figure under the Line shews the Folio of the Ledger where the Credit is entered; and the other smaller Figures against the sundry Debtors, or sundry Creditors (whether Goods or Persons) shew also in what Folios of the Ledger they are posted.

The Accounts of Persons and Things are kept in the Ledger, on opposite Pages, in which those, which in the Journal are said to be Debtors, are entered on the Left hand Page with the Word *To;* and those, to which they are said to be Creditors, are entered on the Right-hand Page, with the word *By.*

For Instance, the last Journal Entry should be posted on he Left-hand, or Debtor's Side, of the Account of *Canary* Wines, thus:

805.
Feb. 24. To *Leonard Legg*———4 Pipes———112 0 0

And the same should be posted on the Right-hand, or Creditor Side, of the Account of *Leonard Legg*, thus:

1805.
Feb. 24. By *Canary* Wines to pay in 6 Months. 112 0 0

There are several other Books used by Merchants besides the three before-mentioned; as the *Cash Book*, which is ruled as the Ledger, and folioed, likewise; in this all Receipts of Money are entered on the Left-hand Folio, and Payments on the Right; specifying in every Entry the Day of the Month (the Year being set on the Top) for what and for whose Account the Money was received, or paid; and the total Debit or Credit on each Side is to be posted into the Ledger to the Account of Cash therein, in one Line of either Side, *viz.* to, or by sundry Accounts, as *per* Cash-book, Folio, *&c.* which is to be done once a Month, or at Discretion, and the Particulars of each Side, Article by Article, are to be posted into the Ledger to the proper Accounts unto which they belong: with References in the Cash Book to the several Folios in the Ledger; and carry the Balance over Leaf into the Cash Book, by which you may know at any Time what Cash you have, or ought to have by you.

Another Book, is a Book of Charges of Merchandize, wherein is to be entered the Custom and petty Charges of any Goods shipped; as Porterage, Wharfage, Warehouse-room, *&c.* which once a Month is transferred into the Cash-book on the Credit Side, making Reference to the Book of Charges of Merchandize; and likewise the same in the Debtor Side of the same Account in the Ledger for the Amount thereof.

The next Book I shall name, is the Invoice Book, or Book of Factories. In this Book is to be copied all Invoices of Goods shipped, either for Accompts proper or portable; and also of Goods received from Abroad, which must always be entered on the Left Side, leaving the Right Side blank; and on the Advice of the Disposal of Goods sent abroad, and also on the Sale of Goods receiv from abroad, enter them on the Blank or Right-side ; so first View may be seen how the Accompt stands, &c.

The next is a Bill-book, in which are entered Bills of E change accepted, and when they become due ; and whe paid, they should be made so in the Margin.

The next is a Book of Houshold Expences, for th monthly Charge spent in Housekeeping ; likewise Apparel, House-rent, Servants Wages, and Pocket Expences and this may be monthly summed up, and carried to th Credit of Cash.

Besides the above-mentioned, there must be a Book t copy all Letters sent Abroad, or beyond the seas ; in whic the Name of the Person or Persons to whom the Letter sent, must be written pretty full, for the readier finding th same.

The next, (and what is very necessary) a Receipt-book wherein are given Receipts for Money paid and expresse for whose Account or Use, or for what it is received ; t which the receiving Person must set his Name for himself or some other, with the Year and Day of the Month on th Top.

Lastly, A Note, or Memorandum-book, to minute dow Affairs that occur, for the better Help of Memory ; and i of great Use, where there is a Multiplicity of Business.

Having given an Account of the several Books and thei Use, the next Thing necessary will be, to give some fev Rules of Aid, to enable the Book-keeper to make prope Entries ; and to distinguish the several Debtors and Creditors, *viz.*

First, For Money received, make Cash Dr. to the Part that paid it (if for his own Account) and the Party Cr.

Secondly, Money paid, make the Receiver Dr. (if for hi own Account) and Cash Cr.

Thirdly, Goods bought for ready Money, make the Good Dr. to Cash, and Cash Cr. by the Goods.

Fourthly, Goods sold for ready Money just the contrary *i. e.* Cash Dr. and Goods Cr.

Fifthly, Goods bought for Time ; Goods bought are Dr to the Seller of them, and the Seller Cr. by the Goods.

Sixthly, Goods sold for Time, just the contrary *i. e.* th Party that bought them is Dr. to the Goods, and the Good Cr. by the Party.

Seventhly, Goods bought, Part for ready Money, and the rest for Time; First, make the Goods Dr. to the Party for the Whole; Secondly, make the Party Dr. to Cash for the Money Paid him in Part of those Goods.

Eighthly, Goods sold, Part for ready Money, and the Rest for Time: First, make the Party Dr. to the Goods for the Whole. Secondly, Cash Dr. to the Party received of him in Part of those Goods.——Or either of these two last Rules may be made Dr. to Sundries; as Goods bought, Dr. to the selling Man for so much as is left unpaid, and to Cash for so much paid in ready Money: And so on the contrary for Goods sold.

Ninthly, When you pay Money before it is due, and are to have Discount allowed you, make the Person Debtor to Cash for so much as you pay him, and to Profit and Loss for the Discount; or make the receiving Man Dr. to Sundries as before.

Profit and Loss is Dr.

To Cash for what Money you pay and have nothing for it, as Discount of Money you receive before due, and for Abatement by Composition, Houshold Expences, &c.

Per Contra, Cr.

By Cash for all you receive, and deliver nothing for it, as Discount for prompt Payment, any Legacy left you, Money received with an Apprentice, and by the Profit of every particular Commodity you deal in, by Ships in Company, by Voyages, &c.

To balance, or clear an Account when full written.

FIRST, if the Dr. Side be more than the Credit, make the old Account Cr. by the New; and if the contrary, make the new Account Dr. to the Old. But if the Dr. Side be less than the Credit, then make the old Account Dr. to the New, and the new Account Cr. by the Old, for such a Rest or Sum as you shall find in the Account.

2. An Account of Company, wherein you have placed more received of another than his Stock; then add as much on the Debit Side as you find on the Credit Side; to the End that in the new Account you may have so much Debit as you put in, and so much Credit as you have received.

3. In Accounts of Merchandize, you must enter the Gain, or Loss, before you make the old Account Cr. by

the New, and the New Dr. to the Old, for the Remaind of the Goods unsold.

4. In the Foreign Accompts, which you are to keep wi a double Column for the Dollars, Crowns, or other Forei Coins, as well as their Value in *l. s. d.* which have bee received or paid, by Bills of Exchange for Goods sold Factors or Correspondents, or bought by them for the A compts before; here you must first balance the said inwa Column of Dollars, Crowns, *&c.*

To remove an Accompt full written to another Folio.

Sum or add up the Dr. and Cr. Sides, and see the Diffe ence, which place to its opposite: As admit the Cr. Si exceeds the Dr. then you are to write the Line in the o Accompt to balance on the Dr. Side, to answer the Line the Cr. Side of the New Accompt.

How to balance at the Year's End, and thereby to know t State of your Affairs and Circumstances.

YOU must make an Accompt, of Balance on the ne void Leaf or Folio of your Ledger to your other Accompt but after so done, do not venture to draw out the A compt of Balance in the said Folio, till you have ma it exact on a Sheet of Paper, ruled and titled for that Purpos because of Mistakes or Errors that may occur or happen i the Course of balancing your Ledger; which are to b rectified, and will cause Erasements or Alterations i that Accompt, which ought to be very fair and exact; an after you have made it to bear in the said Sheet, copy fair th said Account of Balance in the Ledger.

The Rules for balancing are these, *viz.*

1*st.* Even your Account of Cash, and bear the Nett Re to balance Dr.

2*dly.* Cast up all your Goods bought, and those sol of what Kind soever, in each Account of Goods; and se whether all Goods bought, be sold or not; and if any r main unsold, value them as they cost you, or according the present Market Price, ready Money; and bear the Ne Rest to balance Dr.

3*dly.* See what your Goods or Wares severally cost, an also how much they were sold for, and bear the Nett Gai or Loss to the Accompt of Profit and Loss.

4*thly.* Even all the personal Accompts with your Dr and your Crs. in order as they lie, and bear the Nett Rest them severally to Balance.

5*thl*

thly. Even your Voyages, your Factors Accompts,
rein is either Gain or Loss, and bear the Nett Gain
oss to the Accompt of Profit and Loss, and the Goods
old to Balance.

thly. Even the Accompt of Profit and Loss, and bear
Nett rest to Stock or Capital, as an Advance to your
k or Capital.

thly. Even your Stock, and bear the Nett Rest to Ba-
e Cr.

hen cast up the Dr. and Cr. Sides of your Balance; and
ey come out both alike, then are your Accompts well
t; otherwise you must find out your Error by pricking
your Books again, to see whether you have entered
y Dr. and Cr. in the Ledger as you ought.

ote, *By pricking over the Book is meant, an examining*
y Article of the Journal, against the Ledger, and marking
us, : *or thus* † ; *and upon the second Examination thus* ‡ ;
upon a third Examination thus § ; *or any other Mark.*

ote also, *In all Accompts of Goods, you must keep a Co-*
in the Middle of the Leaf, of each Side, for Number,
ght, or Measure.

hough all that hath been said in Relation to Book-keep-
and the several Rules thereunto belonging, may seem
tle abstruse to the altogether Unlearned therein, yet
e is no such mighty Difficulty to instruct them as they
imagine: For these following Hints may render
t hath been already said intelligible to an ordinary
acity.

st. Stick close to the Text, or general Rules before-
tioned, *viz.* That all Things received, or, the Receiver,
Debtor to all Things delivered, or the Deliverer; for
Rule holds good in all Cases.

d. When the Dr. (whether Person or Goods) is known,
Cr. is easily understood without mentioning it: for if *A.*
r. to *B.* then *B.* is Cr. by *A.* for what Sum soever it be:
, if Goods be Dr: to C. then C. is Cr. by those Goods
he Sum they amount to.

dly. This Art of Book-keeping, is called *Book-keeping by*
ble Entry, because there must be two Entries; the first
g a charging of a Person, Money, or Goods, and the
nd a discharging of a Person, Money, or Goods.

thly. strictly note, That if the first Entry be on the Dr. or
t-hand Side of your Ledger, the next or second Entry
must

must always be made on the Right or Credit Side of Ledger; for when one Person or Thing is charged, thei ways another Person or Thing is discharged for the Sum, let it be what it will.

And so it is in balancing an Accompt, and carrying another Folio; for if the old Accompt be settled b Balance on the Credit Side, then the new Accompt mu debited or charged on the Debit-side for the Sum, balanced the old Account.

Much more might be said on this *Art of Book-keeping* had Room; but I have said what I hope may be sufficien the Instruction and Improvement of any intelligent Rea

The next Matter I shall go upon is, to shew, or give amples of various Kinds of Receipts, and Promissory N also Bills of Parcels in different Trades; likewise Bil Book-debts, Bills of Exchange, with Remarks on th and some other Precedents of Writings in Trade and cantile Affairs.

And first of Receipts of different Forms.

RECEIVED *September* 23, 1805, of Mr. *Anthony Ar* the Sum of Six Pounds Nine Shillings; I say receive my Master, *Bryan Barry, per* me.

£. 6 9 *Caleb Catchmoney.*

London, September 23, 1805.

Received of Mr. *Kendrick Keeptouch,* Ten Pounds El Shillings and Sixpence in Full Payment, *per* me

£. 10 11 6 *Henry Hasty.*

Note, *The Sum received must always be expressed in W at Length, and not in Figures, in the Body of the Receipt; b may, and ought to be, expressed in Figures between two Lin the Left-hand of the Name at the Bottom of the Receipt as as in the Body of the Receipt.*

—For Stamps on Receipts, &c. &c. See the Table far on.

When a Receipt is given in a Book, there is no Occa to mention the Man's Name of whom you receive Money, because that is implied, he being the Owner o Book.

A Receipt in Part of Goods sold.

eceived the 24th of *September*, 1805. of Mr. *Timothy hittle*, Fifty Pounds in part of *Indigo*, sold him the 22d nt, *per* me

50 0 0

Lawrence Lovemoney.

A Receipt given in a Receipt Book.

eceived the 26th of *September*, 1805, the Sum of Forty-Pounds, by the Order, and for the Account of *George dy*, Esq. *per*

45 0 0

Timothy Trusty.

eceived the 27th of *September*, 1805, of Mr. *Daniel nport* and Company One Hundred Pounds, on Account lf and Partner, *per*

100 0 0

James Jenks.

eceived the 28th of *September*, 1805, of Mr. *Peter tual*, Fifty-five Pounds, Sixteen Shillings and Nine-e in Part for Tobacco sold him the 24th of *August* last,

55 16 9

Fabian Funk.

eceived the 29th of *September*, 1805, of the Honourable *India* Company, Three Hundred and Fifteen Pounds Shillings, *per* Order, and for the Account of *Peter er*, *per*

315 10 0

Stephen Storax.

eceived *October* 2d, 1805, of the Governor and Com- of the Bank of *England* One Thousand Six Hundred nds Ten Shillings, for Self and Company, *per*

1600 10 0

Leonard Longpurse.

Receive

Received the 5th of *October*, 1805, of the Worsh Company of *Grocers*, Forty-nine Pounds, Fifteen Shilli in full Payment for my Father *Peter Plumb*, *per* me

£. 49 15 0 *Peter Plumb*, ju

Received the 6th of *October*, 1805, of *Richard Clarke*, Chamberlain of *London*, the Sum of Sixty Pounds, fo Use of the Worshipful Company of *Joiners*, *per*

£. 60 0 0 *Caleb Car*

A Rent Gatherer's Bill.

Received the 24th of *October*, 1805, of Mr. *Aaron Ar* in Money, Eighteen Pounds, and allowed him for Land Five Pounds, and for Repairs Two Pounds, in all Twe five Pounds, in full for half a Year's Rent due at *Michae* last; I say received for the Use of *Lawrence Letland*, by Virtue of his Letter of Attorney, *per*

£. 25 0 0 *Robert Ren*

Received of Mr. *Timothy Tenant*, this 25th Day of *ber*, 1805, Six Pounds for a Quarter's Rent due at *Mic* *mas* last, for my Master *Lancelot Letfarm*, *per*

£. 6 0 0 *Francis Fait*

Received *August* 24, 1805, of Mr. *Brook Bishop*, Twe nine Pounds, Six Shillings, in Part of a Bill of Sixty Po due, the 3d of *October* next, to Mr. *Samuel Shuffle*, *per*

£. 29 6 0 *Francis Fa*

A Receipt on the Back of a Bill of Exchange.

September 30, 1805, received the full Contents of within mentioned, being Five Hundred Pieces of Eight

500 Pieces of 8 *Nathan N*

Promis

Promissory Notes.

I Promise to pay to Mr. *Timothy Teazer*, or Order, Sixty Pounds, on the 26th of this Instant *September*. Witness ny Hand this 15th of *September*, 1805.

. 60 0 0

Daniel Dilatory.

October 18th, 1805.

I Promise to pay to the Honourable the Directors of the South Sea Company, or Bearer, on Demand, Four Hun-lred Fifty Pounds, for my Father, *James Jones*.

. 450

Joshua Jones.

25th *October*, 1805.

I Promise to pay to the Governor and Company of the Bank of *England*, or Order on Demand, Two Thousand Pounds.

. 2000

Nahum Neednothing.

October 24th, 1805.

I Promise to pay to *Miles Man*, and Company, or Bearer, n Demand, Seven Hundred Fifty-six Pounds Ten Shil-ngs and Nine-pence, for my Master, *Robert Regular*.

756 10 9

Mark Martin.

October 25th, 1805.

I Promise to pay to the Honourable *East India* Company, r Bearer, upon Demand, Five Hundred Pounds, for *Ienry Hudson*.

. 500

Martin Moneybag.

October 26th, 1805.

I Promise to pay to Mr. *Christopher Cash*, or Order, Three Ionths after Date, Five Pounds, for value received. Vitness my Hand this 26th Day of *October*, 1805.

5 0 0

Robert Ruck.

A Note

A Note given by Two.

WE, or either of us, promise to pay to Mr. *Matthe Mistrust*, or his Order, Six Pounds Sterling, on Demand for Value received. Witness our Hands this 27th o *September*, 1805.

l. 6 0 0

Nathan Needy
Samuel Surety

Witness Nicholas Notice.

A Bill of Debt.

Memorandum. That I *William Want*, of *London*, Weave do owe, and am indebted unto Mr. *Timothy Trust*, c *Westminster*, Watch-maker, the Sum of Twenty-fiv Pounds Six Shillings of lawful Money of *Great Britain* which Sum I promise to pay to the said *Timothy Trust*, hi Executors, Administrators, or Assigns, on or before th 10th Day of *December*, next ensuing. Witness my Han this 22d Day of *October*, 1805. *William Wan*

Witness Titus Testis.

Bill of Parcels.

It is usual, when Goods are sold, for the Seller to de liver to the Buyer, with the Goods, a Bill of Parcel which is a Note of their Contents and Prices, with a Tot of their Value cast up, *&c.* These Bills ought to be hand somely written, and in a methodical Order, according the best and customary Way of each particular Trade.

I shall therefore shew the Form of Bills of Parcels i some Trades and Professions, with the shortest Methods casting up the several Articles in each Bill.

A Mercer's Bill.

Richard Jones, Esq. London, September 26, 1805.

Bought of *Abel Atlas*, and *Ben. Burdett*, *viz.*

12 Yds. $\frac{3}{4}$ of rich Sattin, at 12*s.* 6*d.* *per* Yd. -	7	19
8 Yds. of sprigged Tabby, at 6*s.* 3*d.* *per* Yd. - -	2	10
5 Yds. $\frac{1}{4}$ of Farringdon, at 6*s.* 8*d.* *per* Yd. -	1	15
6 Yds. of Mohair, at 4*s.* 2*d.* *per* Yd. - - - -	1	5
17 Yds. $\frac{1}{2}$ of Lutestring, at 3*s.* 4*d.* *per* Yd. - -	2	18
£.	16	7

Sometim

Sometimes the Money is paid immediately, then the Receipt is made as follows:

Received the 26th of September, 1805, Sixteen Pounds Seven Shillings and Eight-pence half-penny, for *Abel Atlas,* and Company,

Francis Fairspoken.

A Woollen Draper's Bill.

London, September 24*th,* 1805.

Bought of *Benjamin Broadcloth,* 22d of *September,* 1805, *viz.*

7	Yds. of fine *Spanish* Black at - - -	18	4	*per* Yd.
5	Yds. ½ of ditto, at - - - - - -	12	4	ditto.
6	Yds. ¾ of fine mixed Cloth, at - -	15	4	ditto.
16	Yds. ¾ of Frieze, at - - - - - -	3	6	ditto.
4	Yds. of Drab-de-berry, at - - - -	13	5	ditto.
5	Yds. ⅞ of superfine *Spanish* Cloth, - -	18	10	ditto.

The several Articles of these Bills are purposely omitted eing cast up, for the Exercise of the Reader in the Rule f Practice, or in those of *Multiplication* of *Money,* before iewn; which indeed is the best Method of all, for the eady casting up the Articles contained in any Bill of Parels whatsoever.

We will take the last Article of the Woollen Draper's Bill, z. 5 Yds. ⅞, &c. at 18*s.* 10*d. per* Yard.

5⅞

l. 4 14 2
16 5¾

Facit l. 5 10 7¾

18 10
7

8) 131 10

16 5¾

In this Example the Price is multiplied by the Quantity, . 5 Yards ⅞, according to the Rules delivered in *Multication of Money;* and the Product by 5 is *l.* 4 14 2: ien for the ⅞ of a Yard, I multiply the Price of the Inter, *viz.* 18*s.* 10*d.* by the Numerator of the Fraction, *viz.* and divide by the Denominator 8, and the Quotient 16*s.* 5*d.* ¾, agreeably to the Rule in the Doctrine of ictions.—Which 16*s.* 5*d.* ¾ added to *l.* 4 14 2; gives 10 7¾ as in foregoing operation.

A Hosier's Bill.

Mrs. Jones Bought of *Silvester Slipstocking, October* 5, 1805, *viz.*

5	Pair of Women's mixt Worsted Hose, at	5*s.*	7*d.*
3	Pair of Women's Silk Hose, at	9*s.*	4*d.*
22	Pair of Men's Woollen ditto, at	3*s.*	2*d.*
8	Pair of Women's ditto, at	2*s.*	2*d.*
21	Yds. of Flannel, at	1*s.*	11*d.*
8	Pair of Thread Hose at	3*s.*	4*d.*

A Leatherseller's Bill.

Mr. Lee Bought of *Henry Hide*, the 17th of *October*, 1805. *viz.*

		s.	*d.*
15	Large oil'd Lamb Skins, at	1	3½ *per* Skin.
13	Kipp of Goat Skins, at	3	4
107	Allum'd Sheep Skins, at	1	3
19	Calf Skins, at	4	3
85	Oil'd Buck Skins, at	12	9
10	Russia Hides, at	12	9
60	Dicker of Hides, at	11	6

Note, 50 *Goat Skins make a Kipp; and other Skins are Five Score to the Hundred. A Dicker is* 10 *Hides or Skins and* 20 *Dickers a Last.*

A Pewterer's Bill.

Mr. Spackman, Bought of *Andrew Antimony, October the* 7th 1805, *viz.*

		l.	*s.*	*d.*
9	Hard Metal Dishes, wt. 42 *lb.* at 14*d. per lb.*	2	9	
1	Dozen of ditto Plates	0	17	
1	Standish of ditto	0	4	
2	Tankards of ditto	0	5	1
8	Best Spoons	0	4	
13	Hard Metal Porringers	0	3	
1	Salt of ditto	0	1	1
1	Set of Castors	0	10	
		£. 4	15	

Bills on Book Debts.

A Woollen Draper's Bill.

Mr. *Francis Fricze*, Dr. *To Joseph Wise.*

1805.		s.	d.	
April 20	To 16 Yds. ½ of Black Cloth, at	18	3	*per* Yd.
ditto 24	To 4 Yds. ⅛ of Drap-de-berry, at	15	6	
May 4	To 35 Yds. of mixt Grey Cloth, at	10	5	
17	To 9 Yds. of fine ditto, at	17	3	
June 12	To 12 Yds. ½ of fine Broad Cloth, at	17	3	

If the Gentleman pays the whole Bill, then make the Receipt thus:

Received the 19th of *October*, 1805, of Mr. *Francis Frieze*, the Sum of Fifty-four Pounds, for the above Bill, for my Master, *Joseph Wise*,

£. 54

Michael Measurewell.

A Mercer's Bill.

1805.	Madam *Dinah Dilatory*, Dr. to *Bryan Brocade*, viz.			
	Yds.	s.	d.	
March 16	To 16½ of flowered Sattin, at	14	9	*per* Yd.
April 14	To 14 of *Venetian* Silk, at	11	8	
ditto 16	To 99 of Mohair, at	6	3	
May 16	To 14½ of flowered Damask, at	9	7	
June 7	To 5⅛ of *Genoa* Velvet, at	21	6	
ditto 25	To ¾ of Lustring, at	4	7	

If Part of the Bill is paid, write thus:

Received of Madam *Dinah Dilatory*, Twelve Pounds, Ten Shillings, on Account, for my Master, *Bryan Brocade*,

£. 12 10

Henry Hunter.

A Stationer's Bill.

1805.		Mr. *Siscera Scribbler,* Dr. to *Phineas Foolscap,* viz.			
		Reams.	*s.*	*d.*	
July	12	To 57 of Demy Paper, at	20	9	*per R.*
ditto	31	To 195 of 2d Foolscap, at	16	3	
Aug.	24	To 375 of 2d Demy, at	18	2	
7ber	6	To 95 French Royal, at	32	6	
8ber	26	To 26 Rolls of Parchment, at	45	11	

Note. *A Roll of Parchment is* 60 *Skins; a Ream of Paper* 20 *Quires; and a Bundle of Paper is* 2 *Reams.*

A Bricklayer's Bill.

1805.		Mr. *Martin Messuage,* Dr. to *Peter Pantile,* viz.
March	27	To 25 Thousand Bricks, at 35*s.* *per* M.
ditto	30	To 11 Thousand Plain Tiles, at 50*s.* *per* M.
April	1	To 28 C. of Lime at 14*s.* *per* C.
ditto	9	To 20 Loads of Sand, at 5*s.* 6*d.* *per* Load.
May	20	To 140 Ridge of Tiles, at 18*s.* *per* C.
June	24	To 90 Days of Work myself, at 5*s.* *per* Day
		To 90 Days my Man, at 4*s.* 6*d.*
		To 90 Days another Bricklayer, at 4*s.*
		To 90 Days for 2 Labourers at 2*s.* 6*d.* a Day each.

Note. 1000 *plain Tiles is a Load; and* 25 *Bags or Bushels of Lime* 1 C. *A Brick must be* 9 *Inches long, and* 4 *Inches* $\frac{1}{2}$ *broad. Bricks are of three Sorts,* Place Bricks, Red and Grey Stock Bricks.

Here it will be convenient to give a General Rule for the casting up any Thing to be sold by the Thousand; as Bricks, Tiles, Clinkards, or *Flanders* paving Bricks, and several other Things mentioned in the Book of *Rates, viz.* Barrel Hoops, Goose Quills, Oranges and Lemons, Squirrel Skins, Billets, *&c.*

And the easy Rule is this, viz.

Multiply the given Number by the Shillings in the Price, (if the Price be at so many Shillings *per* M). and always cut off three Figures or places towards the Right-Hand; and the Figures towards the Left-hand are Shillings, which divide by 20, to bring them into Pounds; and those Figures separated toward the Right-hand, multiply by 12, the next inferior Denomination, and still cut off or separate three Places towards the Right-hand, and the Figures towards the Left are Pence; and the three last Figures cut off, multiply by 4; and still separate three Places towards the Right-hand, and the Figures towards the Left-hand are Farthings ——And if the Price be Shillings and Pence, or Shillings, Pence and Farthings *per* Thousand, then multiply by the Shillings as before, and take Parts for the Pence and Farthings, as in the Rule of *Practice*; add these together, and proceed as above directed.

Ex. 1. 24650 Bricks at 17*s.* *per* Thousand.

17

172550

24650

419|050 *Answer* 419*s.* 0½*d.* or 20*l.* 19*s.* 0½*d.*

12

0|600

4

2|400

Ex. 2. 6*d.*—½ 261324 Plain Tiles at 16*s.* 6*d.* *per* Thousand.

16

1567944

261324

130662

4311|846 *Answer* 4311*s.* 10*d.* $\frac{608}{1000}$ *f.* or 215*l.* 11*s.* 10*d.*

12

10|152

4

608

When Things are sold by the Hundred, as *Dutch* and *English* Pantiles, then follow this Rule, *viz.*

Multiply the given Quantity by the Shillings in the Price, and take Parts for the Pence and Farthings (if there be any) as before; then from the Right-hand of the Sum cut off two Places, and proceed as in the last Rule.

Ex. 3. 1726 Pantiles, at 7*s.* *per* C.

7
―――
120|82
12
―――
9|84
4
―――
3|36

Answer 120*s.* 9*d.* $\frac{3}{4}$ or 6*l.* 0*s.* 9*d.* $\frac{3}{4}$ and $\frac{36}{100}$ of a Farthing.

Ex. 4. 6*d.*—$\frac{1}{2}$ 2964 Stock Bricks, at 2*s.* 6*d.* *per* C.

2
―――
5928
1482
―――
74|10
12
―――
1|20
4
―――
80

Ans. 74*s.* 1*d.* $\frac{80}{100}$*f.* or 3*l.* 14*s.* 1*d.* &c.

Of Bills of Exchange.

BILLS of Exchange are either Inland, or Foreign. The *Inland* Bills are drawn by one Trader in one City or Town, upon another of another City or Town, in the same Kingdom; as *London* upon *Bristol*, or *Exeter* upon *London*, &c. and these chiefly concern our Shop-keepers, and wholesale Traders, either of Town or Country; and the *Foreign* more immediately concern the Merchants.

Bills of Exchange, if handsomely drawn, must be written in a fair Hand, on a long Piece of Paper, about three Inches broad, and written in Form after the following Precedents.

A Bil

A Bill Payable at Sight.

London, 5th October, 1805.

AT Sight, pay to Mr. *Gregory Greedy,* or his Order, the Sum of Fifty Pounds, for Value received of *Christopher Cash;* and place it to Account, as *per* Advice from

To Mr. Peter Punctual, Your humble Servant,
Grocer, in High-street,
Bristol. *Daniel Drawbill.*

Exon, Nov. 1805.

SEVEN Days after Sight, pay to Mr. *Nathan Needy,* or his Order, Twenty-four Pounds, Ten Shillings, for Value received of Mr. *Timothy Transfer,* and place it to Account, as *per* Advice from

To Mr. Simon Certain, Your Friend and Servant,
Haberdasher, in Milk *Michael Moneyman.*
Street, London.

If Mr. *Needy* send his Servant, *Andrew Benson,* to receive the Money, after he has written his Name on the Back of the Bill, (which is his Order) the Servant must write a Receipt to his Master's Name, thus:

Received, for N. Needy.
A. Benson.

USANCE, is a determined Time fixed for the Payment of Bills of Exchange, reckoned either from the Day of the Bills being accepted, or from the Day of their Date. It is called Usance, because regulated by the Usage or Custom of Places on which they are drawn.

A Foreign Bill of Exchange.

London, 6th *October,* 1805, for 460 Crowns,
at *56d.* $\frac{2}{8}$ Sterling *per* Crown.

At Usance pay this my first Bill of Exchange, (my second or Third not being paid) unto Mr. *Henry Vernon,* or Order, Four Hundred and Sixty Crowns, at 56*d.* $\frac{2}{8}$ *per* Crown, for the Value received of Mr. *Samuel Tompson*, and pass it to Account, as *per* Advice from, Sir,

To Mr. Will Walker, Your humble Servant,
Merchant in Paris. *Ebenezer Reynolds.*

Note. It is usual to send Two and sometimes Three Bills of the same Kind, in case the First, and the Second should, by any Means, not arrive at their Place of Destination.

Another.

London, 17th *October*, 1805, for 480 Dollars,
at 55*d.* $\frac{1}{8}$ *per* Dollar.

AT Three Usance pay this my First Bill of Exchange unto Mr. *William Wealthy*, or Order, Four Hundred and Eighty Dollars, at 55*d.* $\frac{1}{8}$ Sterling, *per* Dollar, for the Value received of himself, and place it to Account, as *per* Advice from

To Mr. Daniel and Your humble Servant,
David Bernardiston,
Merchants in Aleppo. *Mark Mercator.*

Usance between *England* and *France*, or *Holland*, is one Calendar Month; between *England* and *Spain*, or *Portugal*, two Months; between *England* and *Italy*, Three Months, *&c.*

Once more.

Bristol, 8th *October*, 1805, for 600 Pieces of Eight,
53*d.* $\frac{3}{8}$ *per* Piece.

AT double Usance pay this my first Bill of Exchange unto Mr. *Lawrence de Luz*, or his Order, Six Hundred Pieces of Eight *Mexico*, at 53*d.* $\frac{3}{8}$ Sterling *per* Piece of Eight, for Value received of *Gomes Henriques*, and pass it to Account, as *per* Advice from yours,

To Mr. Simon Surepay,
Merchant in Leghorn. *William Henry Hern.*

Notes on Bills of Exchange.

1. *THE Acceptor of any Bill is become absolute Debtor to the Person to whom the Bill is payable for the Contents thereof.*
2. *The Person to whom the Bill is payable must demand the Money the very Day it becomes due, and if the Acceptor dies before it becomes due, it must be demanded of the Executor or Administrator.*
3. *The Drawer of any Bill must always give his Correspondent a Letter of Advice, that he hath drawn such a Bill on him for such a Sum*, &c.
4. *None need pay a Bill without such Letter of Advice.*
5. *In* England *a Bill is due the third Day after the Expiration of the Time mentioned in the Bill.*

Of Indorsing.

IT frequently happens, that between the Acceptance of a Bill and the Time of Payment, the Party to whom it is first made payable, hath Occasion to pay it away. If so, he writes his Name on the Back of the Bill, which is his Order, and gives it to the Person he is indebted to, and then he is impowered to receive the Money: And if the second Person also wants to pay it away, and then he likewise writes his Name under the other, and delivers it to a third Person to receive the Money; and it may be, the third does the same, and delivers it to a fourth Person, *&c.* All that do so, are Indorsers; and he that last hath the Bill, if the Acceptor will not pay it, may sue him; or the Indorsers, or Drawer, or any of them, for the Money.

An Indorsement is sometimes in these Words, *viz. Pay the Contents of the within-mentioned Bill to* Henry Hasty.

George Greedy.

But generally the Name only is accounted sufficient.

Of Protesting.

WHEN a Bill is to be *Protested*, the Party that hath the Bill must go to a *Public Notary* (not a common *Scrivener*) whose Business it is; and he goes to the Acceptor's House, and demands Payment, *&c.* And then he draws up a *Protest* according to Law; which is to be returned to the Drawer, or the Person from whom he received it, within the Time limited, *&c.*

It is needless to give here the Form of a *Protest*, because no Man can do it for himself.

A Bill of Debt.

KNOW all Men by these Presents, That I *Lawrence Lackcash*, of *Southwark*, *Vintner*, do owe and am indebted unto *Charles Creditman*, of the same Place, *Salter*, the Sum of one Hundred and Fifty Pounds of lawful Money of *Great Britain*; which said Sum I promise to pay unto the said *Charles Creditman*, his Executors, Administrators, or Assigns, on or before the 24th of *December* next ensuing the Date hereof. Witness my Hand and Seal this 6th Day of *October*, 1805.

Sealed and delivered
in the Presence of *Lawrence Lackcash.*

A Bill for Money borrowed.

Received and borrowed of *Oliver Overcast*, of *London*, Merchant, Fifty Pounds, which I do hereby promise to pay on Demand. Witness my Hand this 6th Day of *October*, 1805.

£. 50. *Peter Penury.*

The Charge of Noting and Protesting a Bill.

Noting	within the City	1	6	Pro-testing	within	3	0
	without the City	2	6		without	5	0

The Form of a Bill Lading.

Shipped by the Grace of God, in good Order and well-conditioned, by *Edward Export*, of *London*, Merchant, in and upon the good Ship, called the *(Bilboa Merchant of London)* whereof is Master under God for this present Voyage *(Martin Mizen of London*, Mariner.) and now riding at Anchor in (the Port of *London)* and by God's Grace, bound for *(Ca-
T B diz)* to say 1 (Bale of Stocking Baize, and 1 Trunk,
No containing five Hundred Pair of Silk Stockings, Con-
1, 2 tents, &c. as *per* Invoice) being marked and numbered as *per* Margin, and are to be delivered in the like good Order at the aforesaid Port of *(Cadiz)* the

Danger of the Seas only excepted, unto (Mr. *Thomas Drake,* Merchant there), or to his Assigns, he or they paying Freight for the said Goods (three Pieces of Eight *per C.* Wt.) with Primage and Average accustomed. In witness whereof the Master or Purser of the said Ship hath affirmed to (three) Bills of Lading, all of this Tenor and Date, one of which (three) Bills being accomplished, the other (two) to stand void. And so God send the good Ship to her desired Port in Safety. *Amen.*

Dated in *London,* the 6th of *October,* 1805, Inside and Contents unknown to *Martin Mizen.*

Note. *The several Words included in the Parentheses, are to be put into the several vacant places that are in a Blank Bill of Lading.*

Note also. Average, *is the general Allowance made to the Master of the Ship, of* 1*d. or* 2*d. in every Shilling Freight ;* Primage, *a small Allowance to be distributed among the Sailors.*

The Form of an Invoice.

Port Royal in Jamaica, July 24, *Anno.* 1805.

Invoice of five Barrels of Indigo, five Hhds. of Sugar, and five Hhds. of Pimento, shipped on board the *George* of *London, George Jones,* Commander, for Account and Risk of Messrs. *John* and *Thomas Fisher* of *London,* Merchants, being marked and numbered, as *per* Margin :

Contents, Costs and Charges,' as in the following Example.

viz.	Indigo 5 B		*l.*	*s.*	*d.*
I F.	143				
No.	143				
121	146				
to	152				
125	172				
	756 *lb.* Nett. at 2*s.* 2*d.* *per lb.*		81	18	—
	Sugar 5				
	Hhds. Tare				
	C. gr. lb. C. qr. lb.	*C. qr. lb.*			
126	11-3-27—1-2-19	Gross 68-0-0			
to	12-2-19—1-3-0	Tare 8-3-12			
130	13-2-13—1-2-16				
	14-1-15—1-3-11	Nett 59-0-16			
	15-1-10—1-3-22	at 24*s.* *p.* *C.*	70	19	5
	68-0-0—8-3-12				
	Pimento	*lb.*			
	5 Hhds. Tare	2026 Gross			
No.	*lb.* *lb.*	389 Tare			
131	432—84				
to	396—72	Nett 1637 at 11*d.* ½ *per lb.*	78	8	9½
135	410—81				
	376—70	Charges.			
	412—82	To Cost of 5 Barrels and			
		10 Hhds. 4-7-9			
	2026-389	To Storage 1-0-0	5	7	9
			236	13	11½
		To Commission at 5 *per C.*	11	16	8¼
		Errors excepted *per A. B.*			

An Account of Sales.

Port Royal in Jamaica, July 24th, 1805.

Account of Sale of 2765 Ells of brown Ozenbrigs, 1112 Yards of Blue Hartford, 2 Pieces of Grey Cloth, qt. 39 Yards, 50 Pair of fine Worstead Hose, and 175 Ells of Bag Holland, received from on board the Ship *Good Success*, Captain *Samuel Sharp*, Commander, for Account of *Lawrence Lucky*, of *London*, Merchant, is Dr.

	l.	s.	d.	l.	s.	d.
To Portage of ditto	0	17	6			
To Commission of Sales	13	1	11			
To Storage at ½ *per C.*	6	10	11½			
				20	10	4½
To the Nett Product carried to the Credit of your Account, bad Debts excepted				247	6	4½
				267	16	9
Per Contra, Cr.						
By 2765 brown Ozenbrigs, making 3456 Yds. ¼ at 8*d.* ½ *per* Yd. sold *Ambique Baker*				122	8	2
By 1112 Yds. of blue Linen, sold at 7*d.* ¾ *per* Yard				35	18	2
By *James Smart*, for 39 Yds. of Cloth, at 15*s.* *per* Yard				29	5	0
By *Lawrence Monk*, for 50 Pair of Hose, at 7*s.* 10*d.* *per* Pair				19	11	8
By ditto for 175 Ells of Bag Holland, at 6*s.* 3*d.* *per* Ell				54	13	9
				261	16	9

Errors excepted, *July* 24*th*, 1805, *per*
Charles Careful.

Business at the Waterside, concerning Exporting and Importing of Goods, &c. Entering them at the Custom-house, &c.

When there are Goods to export, and ready packed, *&c.* there must be first made a Bill of Entry, (as it is called) of the Contents, after this Form, *viz.*

In the Loyal Merchant, William Worm, for Barbadoes.
Edwin Export.

Three Cases of Haberdashery.
Five Tuns of Beer, &c.

Of these Bills there must be seven, one of which must be in Words at length, and the other may be expressed in Figures: These are by the Clerks of the Custom-house entered into several Books for that Purpose. If some Goods pay Custom, and others not, then there must be made two Entries; one for those that pay Custom, and another for those that pay not; and likewise you must have two Cockets.

A *Cocket* testifies the Payment of all Duties; and is written on a small Piece of Parchment in the following Words:

> *Know ye, that* Edwin Export, *Merchant, for three Cases of Haberdashery, and five Tuns of Beer, in the* Loyal Merchant, William Worm, *for* Barbadoes. *hath paid all Duties. Dated the 9th of* November, 1805.

On the Backside of the *Cocket* you must set down the Marks, Numbers, and Quantity of the Goods expressed in the Inside. Then on clean Paper transcribe your Bill of Entry, upon which a Shipping Bill will be made out, on the Back of which, signify the Marks, Numbers, and Contents, as before on the *Cocket*; both which being thus indorsed, you are to deliver them to the Searcher at the Water-side, who deposits them in the Office till the going away of the Ship, and then they are delivered to the Captain or Master of the Ship.

If you have not Judgment, nor Experience enough to enter your Goods yourself, it is but applying to any one of the Clerks in the Long-room, who make it their Business to enter People's Goods; and for a Shilling they will write your Bills, and pass your Entries, without giving you any farther Trouble, or your running any Risque of making any false Entries, *&c.*

Entry Inwards.

THE Ship being arrived, search the Entry-book in the Long-room, and you will find the Name of the Ship and Captain, as also the Waiters that are to attend the Delivery of the Ship, and at what Key the Goods will be landed. The Entry inwards runs thus:

In the Mercury, John Keelhaul, *from* Antigua.

25 Hhds. of Sugar, &c.
56 Bags of Cotton, &c.

There must be eight of these Bills, (though but seven Outwards) and one of these also must be in Words at Length, which is for the Warrant of Delivery, and must be signed by the Person in whose Name the Goods were entered, and the Mark also in the Margin; which being done, and the Fee for Entry, and Custom paid, you will then have from the Land Waiters a Warrant for the landing and receiving your Goods.

When Goods are to be exported by Certificate, *viz.* Foreign Goods formerly imported; these Goods being to be sent Abroad, or exported to another Place or Country by a Native of *England* within Twelve, or a Stranger within Nine Months after Importation, entitles the Exporter to a Draw-back of part of the Custom paid at the Importation of the said Goods, upon producing a Certificate from the Comptroller, that they have paid the Duties inwards. And the Debenture of Custom Drawback runs thus:

Debenture.

Christopher Commerce, *natural born, did on,* &c. *make an Entry with us of Two Thousand* Ells *of broad* German *Linen, in the* Amazon, *Captain* Stephen Stout, *for* Jamaica, *the Subsidy,* &c, *was paid inwards by,* &c. *as appears* per *Certificate of the Collector inwards: And for further Manifestation of his just Dealing therein, he hath also taken Oath before us of the same.*

Custom-house, London, 9th November, 1805.

The Oath.

Jurat. C. C. *That Two Thousand Ells of broad* Germany *Linen, abovementioned, was really shipped out, and hath not been relanded in any Port or Creek in* England *or* Wales, *since last shipped,* Nov. 9, 1805.

The Certificate Cocket.

London: *Know ye, that* C. C. *for Two Thousand Ells of broad* Germany *Linen, paid* per *&c. the Day,* &c. *last, late unladen and now in the* Amazon, Stephen Stout, *for* Jamaica. *Dated the 9th of* November, 1805.

This *Certificate Cocket* is gained by applying to the Books of the Importer, to know the Day, *&c.* when the Custom inwards was paid, and by whom; which carry to the Long-room in the *Custom-house,* and deliver it to the Comptroller's Clerk of the Subsidy inward and outward, with an Account of what you would export, *&c.*

A little before was mentioned at what Key the Goods should be landed, and therefore here it is proper to name the Keys (or rather Quays) and Wharfs that Goods are usually landed at, which are these, viz.

Somer's Key, Smart's Key, Wiggen's Key, Bear Key, Dice Key,

Key, Custom-house Key, Potter's Key, Wool Key, Galley Key, Brewer's Key, Ralph's Key, Chester's Key, Lyon's Key, Cox's Key; Hammond's, Young's, and Gaunt's Key. And the Wharfs are, *Fresh Wharf* and *Botolph Wharf.*

Besides these, there are certain Places called *Docks,* which are Harbours cut into the Land, where there is no Current, but only a Flow and an Ebb, occasioned by the Rise and Fall of the Tide in the River *Thames;* and these are convenient for the lying of Vessels, Hoys, Lighters, Barges and Boats; and are these, viz.

Billingsgate Dock; Subb's Dock, Tower Dock, St. Catherine's Dock, Wapping Dock, Hermitage Dock, Execution Dock, and *Limehouse Dock.* And above Bridge, *Queenhithe Dock, Puddle Dock, White Friar's Dock,* and *Scotland Yard Dock.* And on *Southwark,* or *Surry Side* are, *St, Saviour's Dock, Clink Dock,* and *Savery's Dock,* below the *Bridge Yard,* and several others for private Uses. But more particularly eminent on that Side of the Water, is the *Bridge Yard* for landing sundry Sorts of Merchandizes, but chiefly from the Ports of *England.*

Of Wharfage and Lighterage.

WHARFINGERS have several Managers over them, and also a Committee to redress Grievances, *&c.* and Clerks of the Stations, with Lighter Managers, and have the letting of many Warehouses, Cellars, &c. they have the Privilege also of keeping Lighters for the Carriage of Goods to and from Ships.

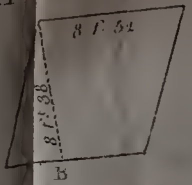
West-India Docks.

THESE immense Works, situated at Blackwall, are intended to receive all the Ships that trade to the West-Indies. The Northern Dock for unloading inwards, covers a Space of 30 Acres, and is capable of containing from 2 to 300 Ships. The smaller Dock will cover an area of 24 Acres, and is devoted solely to the business of loading outwards. The proprietors of these great Works are stiled the *West-India Dock Company.* The Expences have not been very much short of a Million of Money. To reimburse themselves they lay a Tonnage of 6*s.* upon the burthen of every Ship which enters the Docks; and for Wharfage, Landing, Weighing, Cooperage, Warehouse-room, &c. they are entitled to certain Rates upon all Goods that are discharged.

Place this at the end of Measuring.

MENSURATION.

Fig. 1



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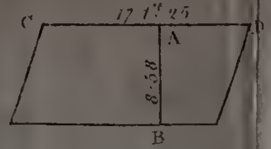

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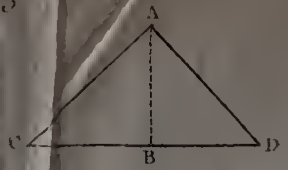

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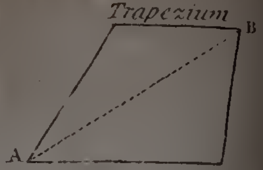

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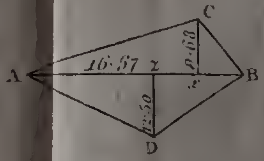

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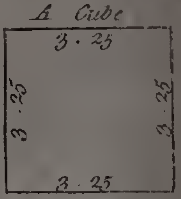

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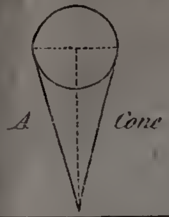

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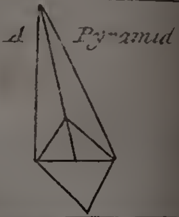

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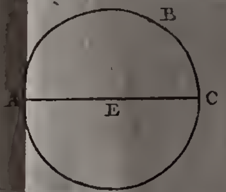

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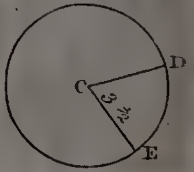

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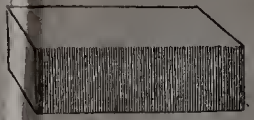

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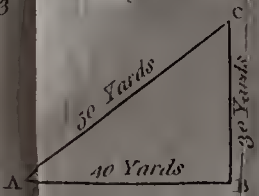

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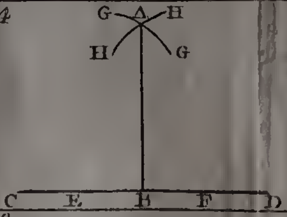

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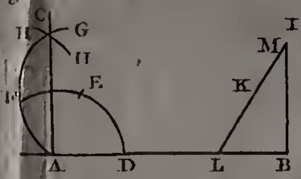

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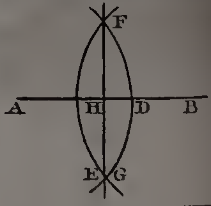

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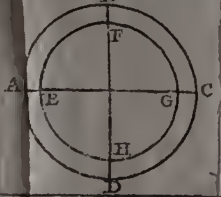

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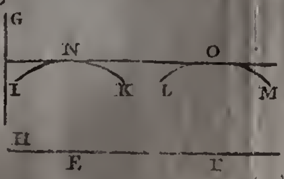

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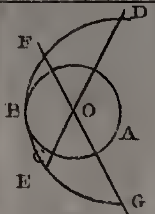

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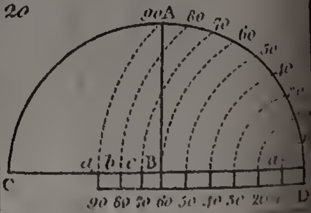


THE DOCKS AT WAPPING are upon a still larger Scale, and for more general Purposes.

Husbands of Ships.

WHERE several Persons are concerned in a Ship, there is usually a Husband chosen by them, to take an Account of every Merchant's Goods, *&c.* and pay the Wharfage, Lighterage, Porterage, *&c.* and these Husbands are to collect every Merchant's Proportion, when they do the Owner's Freight.

Of MENSURATION of Planes and Solids.

THE several Kinds of Measuring are three, *viz.*

1*st.* *Lineal*, by some called *Running Measure*, and is taken y a Line, and respects Length without Breadth; the Parts f which are,

12 Inches 1 Foot, 3 Feet 1 Yard, 16 Feet and a half 1 Rod, Pole, or Perch.

All Kinds of ornamental Work, such as a Cornice, Frieze, &c. are measured by *Running Measure.*

2*dly*, *Superficial* or Square Measure, is that which respects Length and Breadth; and the Parts are,

144 Inches 1 Foot, 72 Inches half a Foot, 36 Inches one Quarter of a Foot, 18 Inches half a Quarter of a Foot, 72 Feet and a Quarter 1 Rod, 136 Feet half a Rod; 1296 nches, or 9 Feet, one superficial, or square Yard.

3*dly*, *Solid*, or Cube Measure, which respects Length, readth, and Depth, or Thickness; and the Parts are,

1728 Inches 1 Foot, 1296 Inches three Quarters of a oot, 864 Inches half a Foot, 432 Inches one Quarter of a oot, and 27 Feet one Solid Yard.

Superficial Measure.

TO measure Things that have Length and Breadth, such Board, Glass, Pavement, Wainscot, and Land, is to take e Dimensions of the Length and Breadth, according to the stomary Methods used in each particular; for instance, ard and Glass are measured by the Foot, the Dimenns are taken in Feet and Inches, and the Content given Feet.

The Dimensions of Wainscoting and Paving, Plaistering,

an

and Painting, are taken in Feet and Inches, and the Content given in Yards.

Of the Square and superficial Contents or Area.

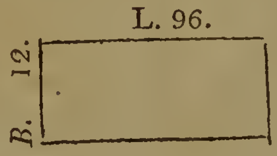
The squaring of any Number is multiplying it into itself, as 12 Inches multiplied by 12 Inches make 144 square Inches. The superficial Content or Area of any Thing is found four several Ways, viz. by whole Numbers, by Decimals, by Practice, and by Cross Multiplication; in each of which Methods I shall give examples of Operation.

A Rectangle hath its Sides perpendicular, and those that are opposite equal; but the adjacent Sides are unequal; Boards, Wainscots, Ceilings, Windows, Doors, &c. are commonly of this Figure.

When any Thing is to be measured, it must be considered what Form or Fashion it is of; and then it must be measured according to the several Rules for each Figure.

First. If it be a Square or Oblong, then the Length and Breadth must be multiplied one by the other, which gives the Content in square Measure, and that Product must be divided by its proper Divisor, according to the Name in which the Content or Area is to be given.

Ex. Admit a Board be 12 Inches Broad, and 8 Feet or 9 Inches long, how many square, or superficial Feet doth i contain?



96
12

144)1152(8 Feet.
1152

(0)

Here the Length in Inches is multiplied by the Breadt in Inches, and the Product 1152 divided by 144, the squar Inches in a Foot, quotes 8 Feet square for the Content of th Board.

A Rule for Dispatch.

If the Length of a Board, or Piece of Glass, be give in Feet, and the Breadth in Inches, multiply one by th othe ther, (without any Reduction) and divide the Product by 12; and the Quotient will be the Answer in Feet, and the Remainder will be Parts of a Foot. So the foregoing Example might have been done sooner by dividing 96 the Length by 12 the Breadth, and it quotes 8 Feet for the Content, by the former Way.

Ex. Suppose a Board be 14 Inches long, and 15 Inches broad, what is the Content in square Feet?

14 Feet long.
15 Inches broad.

12)210

Feet 17 $\frac{6}{12}$ or $\frac{1}{2}$

The Answer is 17 Feet and $\frac{1}{2}$. And so for any other Example of this Kind.

Or thus:
14
by 1—3

14
3 is $\frac{1}{4}$ 3$\frac{2}{4}$ or $\frac{1}{2}$

Answer 17$\frac{1}{2}$.

Here 3 Inches is the $\frac{1}{4}$ of a Foot, wherefore $\frac{1}{4}$ of 14 is taken and added to 14, and it makes 17 Feet, and $\frac{2}{4}$ equal to $\frac{1}{2}$.

Another Example worked four different Ways.

If a Board be 12 Feet $\frac{1}{2}$, or 150 Inches long, and 15 Inches broad, how many square Feet doth it contain?

VULGARLY.
Inches,
150 long.
15 broad.

750
150

2250

DECIMALLY.
12,5
1,25

625
250
125

Feet, 15,625

144)2250(15 Feet
144

810
720

Rem. 90
Multiply by 12 Inch. 1 Foot.

144)1080(7 Inches.
1008

Rem^r. 72
Multiply by 4 the Quarters in an Inch.

144)288(2 Quarters or ½.
288

...

Feet 15,62
1

Inches 7,50

Quarters 2,00

By Cross Multiplication.

	Feet.	*In.*	
	12	6	
	1	3	
	12	6	
	3	1	6″
Answer	15	7	6″

By Practice.

	Feet.	*In.*
	12	6
	1	3
	12	6
3 Inches is ¼	3	1½
	15	7½

The four Methods here used are as follow: First, by multiplying the Inches together, and dividing by 144, &c. The second Work is performed decimally; the third Method is by Cross Multiplication; and the last and best i by Practice.

Any of these Methods may be easily understood by the Use of the Arithmetical Part of this Book, except the Metho by Cross Multiplication, which may be thus explained:

Rule. Under the Multiplicand write the corresponding Denominations of the Multiplier.—Multiply each Term in the Multiplicand, beginning at the lowest, by the *Feet* in the Multiplier, write each Result under each respective Term; carryarrying an Unit for every 12, from each lower Name to its ext higher.

Note. Feet multiplied by Feet give Feet:—Feet multi- lied by Inches give Inches: but Inches multiplied by nches give Seconds.

In the same way multiply all the Terms of the Multipli- ınd by the *Inches* in the Multiplier, writing the Result of ıch Term one Place removed to the right Hand of those in e Multiplicand. Do the same with the *Seconds* in the Mul- plier, getting the Result of each Term two Places re- oved to the Right-hand of those in the Multiplicand. hus in the Example, I say, once 6 is 6, and once 12 is 2;—then with the 3 Inches I say, 3 Times 6 is 18, that 6 and carry 1, (putting the 6 to the Right-hand of the ne of Inches) 3 Times 12 are 36 and 1 are 37, but 37 Inches e three Feet, one Inch, which I put in their proper Places. ıow add the two Rows together; which make 15 Feet, Inches, and 6 Seconds.

If a board be wider at one End than the other, then take Breadth in the Middle, or add the Measure of both Ends ether, and take the Half of the main Breadth, which mul- ly by the Length.

Example.

Suppose a Board to be 120 Inches long, and the narrow- End 10 Inches wide, the broadest End 34 Inches wide; ıat is its Content in superficial Feet.

d { 34 broadest End.
  { 10 narrowest.

Sum 44
Half——
is 22 the Medium between the least and greatest [Lengths.
120 the Length

44)2640(18 Feet $\frac{1}{3}$ *Answer.*
144.
——
1200
1152
——
Rem. 48

48
12
——
144)576 } 4 Inches or $\frac{1}{3}$
576 } of a Foot.
——
...

Or thus :

Feet.	*Inches.*	
10	0	the Length, equal 120 Inche
1	10	the mean Breadth, or 22 Incl
10	0	
8	4	0″
18	4	*Answer.*

If a Board or Piece of Glass be ever so irregular, it ma be measured very near, by taking the Breadth in 5 or Places, and add the several Breadths together, dividing tl Total by the Number of Places, and the Quotient will l the main Breadth ; which multiply by the Length, &c.

Having the Breadth in Inches of any Board, or Piece Glass, to know how much the Length of that Board or Pie of Glass will make a Foot superficial.

Rule. Divide 144 by the Inches in Breadth, and the Qu tient will be the Length of that Board that will make Foot.

Example.

If one Board be 9 Inches broad, and another 24 Inche what Length of Board will make each a superficial Foot ?

9) 144   24)144(6 *Answer.*
                     144

Answer 16

That is, one must be 16 Inches long, and the ot only 6.

Proper Directions for Joiners, Painters, Glaziers, &c.

Rooms being various in their Forms, take this gene Rule in all Cases, *viz.*

Take a Line, and apply one End of it to any Corner the Room ; then measure the Room, going into every C ner with the Line, till you come to the Place where you began ; then see how many Feet and Inches the String c tains, and set it down for the Compass or Round ; then t the Height by the same Method.

Glaziers are to take the Depth and Breadth of their W and multiply one by the other, dividing by 144 ; Glass ing measured as Board.

Having thus shewn the Methods of casting up Din sions, I come now to Particulars ; and first of

Gla

Glaziers Work by the Foot.

If the Windows be square, or rectangular, multiply the ength by the Breadth; which will produce the Content, as t has already been shewn.

Example.

By Cross Multiplication.		By Practice.
Feet. *In.*		*Feet.* *In.*
8—9 high		8 — 9
7—3 broad		7 Feet
61—3		61 — 3
2—2 3″	3 Inches ¼	2 — 2¼
63—5 3″		63 — 5¼ *Answer.*

Thus if the Value of a Window be required whose height 8 Feet 9 Inches, and breadth 7 feet 3 Inches, at 20*d.* per oot Square, I first find the Number of Feet in the Winow, which in this case are 65 Feet 5 Inches, 3 Seconds; nd to avoid Fractions, I call this 65 Feet 6 Inches, or 65½ eet, which I multiply by 20*d.* for the Value of each Foot, nd divide by 12 and by 20.

65,5
20
12)1310,0
2,0)10,9---2

Here it is convenient to throw the ½ into the Decimal ,5, & work as by the Rule in Decimals.

Answer L. 5—9---2

If the Windows are arched, or have a curved Form, no llowance is made, by reason of the extraordinary Trouble, nd Waste of Time, Expence or Waste of Glass, *&c.* And ne Dimensions taken from the highest Part of the Arch, own to the Bottom of the Window, from the Height or ength; which multiply by the Breadth, and the Product ill be the Answer in Feet, *&c.*

Glaziers are often so very nice, as to take their Dimen-ons, and to measure to a Quarter of an Inch.

Ex. How much does a Window measure whose Height is 4—3½, and breadth 2—7¾? Work by Practice.

	Feet.	*In.*
	4 ——	3½ long.
	2 ——	7¾ broad.
6 inches is ½	8 ——	7
1 ½ is ¼ of 6 Inches	2 ——	1¾
¼ is ⅙ of 1½		6¼
		1
	11 ——	4

Here I have neglected the Parts, beyond the Fractions of an Inch; but the Work may be carried to great Accuracy by Cross Multiplication, or as it is usually called by Duodecimals, thus

Feet.	*In.*	''	'''	''''
4	3	6		
2	7	9		
8	7	0		
2	6	0	6	
	3	2	7	6
11	4	3	1	6

Here we see the accurate Answer; for Cross Multiplication is capable of being carried to Thirds and Fourths; as Inches multiplied into Inches give Seconds, so Inches by Seconds give Thirds, and Seconds by Seconds give Fourths.

Glass is measured by the Foot, and the Price of it is as follows, *viz.*

	s.	*d.*		*s.*	*d.*
Best Newcastle Crown, according to the Size from - - -	1	7	to	2	1
Second ditto - . -	1	5		1	11
Green Glass - - -	1	0		1	2

Painters Work by the Yard.

WHEN the Wainscot of a Room is painted, you are to measure round the Room with a Line, as hinted before, and the Height is to be taken by girting a String over all the Mouldings from the Top of the Cornice to the Floor: then multiply the Compass by the Height, and you have the Content in Feet and Inches; which may be reduced into square Yards, by dividing by 9.

Example.

Example 1.

A Room painted,
Feet. *In.*
Being 45 — 8 in Compass
10 F. 6 high,

What is the Content in square Yards?

456 — 8
22 — 10

9)479 — 6

Yards 53 — 2—6 *Answer.*

Example.

If the Height of the Room painted be 12 Feet 4, and the Compass 84 Feet 11; what square Yards doth it contain? Answer, 116 Yards 3 Feet $3\frac{2}{3}$.

Feet. *In.*
84 — 11 Compass
12 — 4 high

1019 — 0
28 — 3--8

9) 1047 — 3--8

Yards 116—3—3--8

Note. Double Work is allowed in Window Shutters; Sash Frames and Mantlepieces are reckoned by themselves, unless the Mantlepieces stand in the Wainscot, and then they are to be measured as plain Work, deducting nothing for the Vacancy.

Painting Common Colours,

Prices.

	s.	*d.*
Clearcole and once in Oil - -	0	4
——— Twice in Oil - -	0	$5\frac{1}{2}$
——— Three Times in Oil -	0	$7\frac{1}{2}$
Sash Frames twice in Oil, each -	1	0
——— Three Times, each -	1	3
—— Squares, twice in Oil, *per* Dozen	1	0
Water Trunk, Gutters, &c. *per* Foot running	0	1 to 2*d.*
Skirting *per* Foot running - -	0	1 to 2*d.*

Joiners Work.

WAINSCOTING, the Dimensions are taken as in Painting, viz. by measuring the Height and then the Compass; which multiply one into the other, dividing the Product by 9, and the Quotient is the Answer in Square Yards.

Example.

What is the Content of a Piece of Wainscoting that is 9 Feet 3 long, and 6 Feet 6 broad?

Ft. *In.*
9—3
6—6
———
55—6
4—7—6
———
9)60—1½(6 Yds. 6 Feet 1½ in. Answer.
54
—
6
—

The Length and Breadth being multiplied together, brings it into square Feet; which divided by 9, (the square Feet in a Yard) produces 6 Yards $\frac{2}{3}$ for the Answer.

Once more.

There is a Room wainscoted, the Compass of which is 47 Feet 3 Inches, and the Height 7 Feet 6 Inches: what is the Content in Yards square? *Answer* 39 Yards $\frac{1}{3}$.

Feet. *In.*
47—3 Compass.
7—6 the Height.
———
330—9
23—7½
———
9)354—4½
———
39 Yds. $\frac{3}{9}$ or $\frac{1}{3}$.
———

Answer 39 Yds. 3 Feet 4½ in.

Th

The Prices of Joiner's Work.

	l.	s.	d.
Slit Deal wrought, 2 Sides, *per* Foot.	0	0	5
¾ Deal ditto	0	0	6
Inch Deal ditto	0	0	8
1¼ Deal ditto	0	0	9½
1½ Deal ditto	0	0	9
2 Inch Deal do.	0	0	11
¾ Deal Boards for Slating, *per* Square	1	10	0
¾ wrought Weatherboarding	1	12	0
1½ Deal Sashes ovolo	0	0	7
2 Inch Deal ditto	0	0	8
1½ Wainscot ovolo Sashes	0	0	9
2 Inch Ditto	0	0	10
1¼ 2-pannel square Door	0	0	9
1½ 4-pannel ditto	0	0	11
2 Inch Deal 6-pannel moulded 2 Sides	0	1	3
1½ square framed Partition	0	0	8½
Inch Deal keyed dado	0	0	6½
Deal Mouldings *per* Foot superficial	0	1	3

Carpenters Work.

ROOFING, Flooring, and Partitioning, the principal Parts of Carpentry in modern Buildings, are measured by the Square of 10 Feet each Way, that is 100 square Feet.

For roofing, multiply the Depth and half Depth by the Front, or the Front and half Front by the Depth, and you will have the Contents, if the Roof is true Pitch.

The Dimensions are taken in Feet and Inches.

Example.

How many Squares doth that Piece of Work contain that measures 199 Feet 10 Inches in Length, and 10 Feet 7 Inches in Height? *Answ.* 21 Squares 14 Feet 10¾.

Operation.

Feet. In.
199—10 long
10 — 7

1998 —4
116 —6—10

21, 14—10—10 *Answ.* 21 Squares, 14 Feet, 10 Inches $\frac{5}{6}$.

The Division is performed by pointing off two Places towards the Right-hand, and the Number on the Left are Squares, &c.

Again,

If a Floor be 49 Feet 7 Inches 4 Parts long, and 26 Feet 6 Inches broad, how many squares?

The Operation by Practice.

Feet. In. Parts.
49——7——4
26

6 is $\frac{1}{2}$. | 1289——10——8
24——9——8

13, 14——8——4 *Answ.* 13 Square 14 Feet, 8 Inches $\frac{1}{3}$.

In measuring Roofing, no Deduction is made for Sky Lights, Chimney Shafts, *&c.*

In measuring Flooring, from the Content of the whole Floor in Feet, take the Content of the Vacancy for the Stairs in Feet, and the Remainder is the true Content; which bring into Squares as before.

In Partitioning, you must measure the Doors, Door-cases; and Windows by themselves, and deduct their Content out of the Whole, except by Agreement they are included; and then you must mention in the written Agreement, Doors, Doorcases and Windows included.

There are divers Sorts of Carpenters Work belonging to a Building, viz. Cornices, Guttering, Shelves, Dressers, *&c.* all which are measured by superficial Measure. There are also Doors and Door-cases, Lanthorn Lights with their Ornaments, Cellar-doors and Curbs, Columns and Pilasters, all which are valued by the Piece, or the Foot superficial.

Carpenters measure the Timber Frames of any Building (which they call the Carcase) by the Square of 10 superficial Measure, or 100 square Feet, as hinted before.

Sawyers Work.

IN this Place it may not be improper to say something in relation to the Method used by *Sawyers* in measuring their Work. When they work by the Great (as they say) most commonly they measure their Work by the superficial Foot; so there is no great Difficulty in taking the Dimensions; for they account the Depth of the Kerfs for the Breadth, and the Length for the Length. The Dimensions being thus taken in Feet, the Content of one Kerf superficial may be found by multiplying the Length by the Breadth, and then having found the Number of Feet in one Kerf, multiply it by the Number of Kerfs of the same Dimensions, and you will have the Number of Feet in them all.

When thus they have cast up the whole Content of their Work in Feet, they are paid for it by the Hundred, that is, 100 Feet.

If the Kerf be but six Inches or less in Depth, then they have a Custom to be paid for Kerf and half, (as they express it) *i. e.* for half so much more as it comes to by Measure; and the Reason they give for it is, that the Trouble is so much the more on account of often shifting or removing and new binding their Timber, and therefore they insist on it as a customary Price.

Prices of Sawyers Work.

	l.	*s.*	*d.*
12 Feet Deals sawed, *per* Dozen, cuts -	0	3	6
10 Feet do. do. -	0	3	0
12 Feet battens do. - - -	0	3	3
10 Feet do. do. - - -	0	2	9
Ends or half Deals - - -	0	1	9
Fir Timber, at *per* Load, 50 Feet cube -	0	6	0
{ All extra cuts are charged at the Rate of Three Shillings *per* 100 Feet superficial			
Oak Timber *per* Load - - -	0	7	0
Elm do. do. - - -	0	6	0

Of Walling.

WALLING is measured by the Rod Statute-measure, being 272 Feet and ¼ superficial. The Method of taking the Dimensions is thus: for a Wall round an Orchard or the like, they measure the Length by a Line going over the Buttresses; and for the Height they measure over the Mouldings, (pressing the Line into them) even to the Middle of the Coping: they likewise take Notice of the Thickness of the Wall, that is, how many half Bricks in Length the Wall is in Thickness; for three half Bricks, that is a Brick in Length, and one in Breadth, is Standard Thickness; and all Walls, whether less or more, must be reduced to that Thickness by this Rule, viz. multiply the Product of the Length and Height, by the Number of half Bricks that the Wall is in Thickness; which Product divide by 3, and then the Quotient by 272 (the $\frac{1}{4}$ being generally neglected) and the Quotient will be Rods, at a Brick and a half thick, Standard Measure.

Example.

Admit the Face of the Wall to measure 4085 Feet, and the Thickness be two Bricks and a half, or 5 half Bricks thick, how many Rods doth it contain?

4085
5

3)20425

272) 6808(25 Rod.
544

1368 Rod.
1360 *Answ.* 25 $\frac{8}{272}$.

8

When the Work is wrought decimally, then divide by 272$\frac{1}{4}$, or 272,25, which gives the Quotient somewhat less. But the measuring of Brick Work may be shortened by having the Rod of 16 Feet $\frac{1}{2}$ centesimally divided into 100 equal Parts, with which you take the Dimensions, and the Length of the Wall in those Rods; and 100 Parts multiplied by the Height, give the Content in Rods, of any Wall that is a Brick and a half thick. Deduction must be made for Doors, Windows, &c.

A Table to reduce Brick Work to Standard-measure, *i. e.* a Brick and a half thick.

Brick.			
1	Subtract	$\frac{1}{3}$	Reduces to a Brick and $\frac{1}{2}$.
2	Add	$\frac{1}{3}$	
3	Multiply by	2	
4$\frac{1}{2}$		3	
6		4	

Example.

Example.

Suppose a Garden Wall to be 254 Feet round, and 12 Feet 7 Inches high, and three Bricks thick; how many Rods doth it contain?

	254	0
	12	7
In.	3048	0
$6\frac{1}{2}$	127	2
$1\frac{1}{6}$	21	2
	3196	2
		2
	272)6392	4(23, &c.

In this Operation, the Aggregate, or Total, is multiplied by 2, because twice 3 is 6, the Number of half Bricks; and that reduces the Work to Standard measure, as by the Table above.

Of Chimnies.

This Brick-work is commonly agreed for by the Hearth, and also sometimes by the Rod; and the Method of taking Dimensions is thus: If the Chimney stands singly, not leaning against, or being in a Wall, and worked upright over the Mantle-tree to the next Floor, it is girt about the Breast for the Length, and the Height of the Story is taken for the Breadth, and the Thickness of the Jaumbs for the Thickness. But if the Chimney stands against, or in a Wall, which is before measured with the rest of the Building, then the Breadth of the Breast or Front, together with the Depth of the two Jaumbs, is the Length,; the Height of the Story the Breadth, and the Thickness of the Jaumbs the Thickness. But if the Chimney stands in the Corner of a room, and has no Jaumbs, then the Breadth of the Breast is the Breadth, the Height of the Story the Length, and the Thickness the Thickness. And for the Shaft, it is commonly girt in the smallest Part for the Length, and the Thickness of both Sides, for the Thickness; in Consideration of the Widths, Pargetting, Scaffolding, &c.

There is nothing to be deducted for the Vacancy between the Hearth and the Mantle-tree, because of the Width and the Thickening for the next Hearth above.

Gable Ends.

Take half the Perpendicular for the Breadth, and the Width of the House for the Length, or half the Width of the

the House for the Breadth, and the Perpendicular for the Length, which brings the Measure to an Oblong, the Content of which is found by multiplying the Length by the Breadth, &c.

Note. There are several other Things in Bricklayers-work, as Corniee, Facias, Straight Arches, Scheme Arches, Hips and Valleys in Tiling, and Water-courses: All which are measured by the Foot. Also Piers, Pilasters, Rustic Work, &c. which are valued by the Piece.

Prices.

	l.	*s.*	*d.*
Brick-work all Grey Stocks, in Walling, &c. *per* Rod	13	13	0
Labour and Mortar only	3	10	0
Grey Stocks *per* Thousand	2	5	0
Plain Tiles *per* Thousand	2	10	0
Pantiles *per* 100	0	12	0
Bricklayers *per* Day, from 25th March, to 9th Nov.	0	4	6
Ditto ——— from 9th Nov. to 25th March	0	4	0
Labourers *per* Day, from 25th March, to 9th Nov.	0	3	0
Ditto ——— from 9th Nov. to 25th March	0	2	9
Mortar *per* Hod	0	0	7
New plain tiling *per* Square, including all Materials	2	7	0

Paving.

Pavement for Cellars, Wash-houses, &c. is measured b the Square Yard.

Example. If a Cellar, Wash-house, or Court-yard, b paved with Bricks, or pitched with Pebble, being 9 Yard 2 Feet long, and 6 Yards 2 Feet broad; how many Yard square doth it contain? *Answer*, 64 Yards 1 and $\frac{1}{3}$ Feet as in the following Work, by Cross Multiplication.

Yds. *Ft.*
9——2
6——2

58——0
6——$1\frac{1}{3}$

64——$1\frac{1}{3}$

Slating

Slating

Is valued by the Square of 100 Feet; in some Places by the Rod of 18 Feet square: that is 36 square Yards, or 324 Feet.

☞ In Tiling and Slating, where there are Gutters and Valleys, there is commonly an Allowance which is to take the Length of the Roof all along upon the Ridge, which makes the Gutter double Measure; this in some Places is allowed, in others not. Sometimes there is an Addition for hollow Ware, that is Ridge tiles, Gutter-tiles, Corner and Dormar-tiles; and here Customs differ. For in some Places they account one superficial Foot for every lineal Foot or running Measúre; then 100 Feet lineal is reckoned a Square. In other Places, for every 100 of such Tiles they reckon one Square.

Prices of Slating in London, 1805.

Welch Slating, *viz.*	*l.*	*s.*	*d.*
Common double Welch Slating, *per* Square of 100 Feet - - -	1	12	0
Ladies Ditto ————	1	16	0
Countess ditto ————	1	18	0
Welch Rags - - -	2	15	0
Westmorcland Slating, with Iron Nails -	3	0	0
Ditto, with Copper Nails - -	3	3	0
Tavistock Slating - - -	2	4	0
Labour and Materials, ripping old Slating and new laying complete, *per* Square.	0	18	0

Plaistering

Is of two Kinds, *viz. First,* Work lathed and plaistered, sometimes called Ceiling. *Secondly,* Plaistering upon Brick-work, or between the Quarters in Partitioning, by some called Rendering; both which are measured by the Yard square, as the Joiners and Painters do. In taking Dimensions of Ceiling, if the Room be wainscoted, they consider how far the Cornice bears into the Room, by putting up a Stick perpendicular to the Ceiling, close to the Edge of the uppermost Part of the Cornice; and measure the Distance from the perpendicular Stick to the Wainscot; twice which Distance must be deducted from the Length and Breadth of the Room taken upon the Floor, and the Remainder is the true Length and Breadth of the Ceiling. As suppose a Floor is 24 Feet long, and 18 Feet broad; and the Cornice shoots out 6 Inches; deduct a Foot for both Ends, and the Length of the Ceiling is 23 Feet; and the same for the Breadth; it leaves 17 Feet broad; which multiplied together, gives the Content, 391 Feet; or 43 Yards and a half, nearly, thus:

Example.

23 Feet the Length.
17 Feet broad

161
23

9)391(43 Yards, 4 Feet.
36

31
27

4

If the Ceiling of a Room be 19 Feet 10 one Way, and 17 Feet 6 the other, how many square Yards doth it contain?

By Cross Multiplication, thus:

19—10
17— 6

337— 2
9—11

9)347—1(38 Yds. 5 Ft. 1 In.

How many Yards square are there in a Piece of Plaistering that is 47 Feet 4 Inches 7 Parts long and 18 Feet broad?

F. I. Pts.
47—4—7
3 times 6 is 18

142—1—9
6

9)852-10—6(94 Yds. 6 Feet, 10 Inches, 6 Parts.

The

The Prices.	*l.*	*s.*	*d.*
Render 1 Coat and Sett, *per* Yd.	0	0	6
Ditto ——— Floated	0	0	8
Lath Plaister sett	0	1	2
Ditto ——— Floated	0	1	7
Wash, Stop and White	0	0	2
Straw Colouring	0	0	4
Lime Whiting *per* Yd.	0	0	2
Plain Cornice, *per* Foot superficial	0	1	4
Plaisterer *per* Day	0	4	8
Labourer ———	0	3	0
Boy ———	0	1	6
A Bundle Laths and Nails,	0	3	3
Lime and Hair, *per* Hod,	0	1	0
Fine Stuff ——— Ditto	0	1	2

Masons Work.

THE Masons Work, consisting of Stone, is of two Sorts, *viz.* Superficial and Solid. Pavements and the Face of Stone Walls, Houses, *&c.* are measured as Brick-work. If the Work have Ornaments, as Capitals, Pilasters, Rails, and Ballusters, *&c.* then they are valued by the Piece.

Prices.	*s.*	*d.*
Portland Stone, *per* Foot Cube	4	3
Plain Work, super.	0	11
Sunk or moulded Ditto	1	1
Portland Chimney Pieces *per* Foot super.	1	10
Fire-stone, Hearths, and Covings, *per* Foot super.	1	1
Vein Marble Chimney Pieces, set complete 6*s.* 6*d.* to	7	6
Purbeck paving in Courses, *per* Foot super.	1	1
Purbeck Steps, per Foot running	2	9
13 Inch York coping, per Foot running	1	8
York Window Sills, per Foot running	1	3
Labour and Gravel, to pebble Paving, per Yd.	0	8
Clinker Paving all materials, Ditto	6	6
New York Paving, per Foot	0	11
Old Paving relaid, per Foot	0	2

Smith's Work is done by the *lb.*

the Price is as under.	*s.*	*d.*
Chimney bars, &c.	0	6
All framed Work as Gates, &c.	0	8
Iron Bolts and Nuts, &c.	0	8
Cast Iron Rails, &c. ——— per cwt. from 14*s.* to	18	0

Plumber's Prices as under.	*l.*	*s.*	*d.*
Sheet Lead, per cwt.	1	19	0
Milled Lead ———	2	1	0

3½ Rain Pipes, per Foot	0	3	2
¾ Ditto —— per Foot	0	1	4
¾ Joints of Solder	0	2	6
1 Joints ——	0	3	0
1¼ Pipe ——	0	2	0
Solder per lb.	0	1	0
Plumber per Day	0	4	0

Mem. Plumbers allow for old Lead 4s. per Cwt. less than the Price of new cast Lead; it is customary to deduct 2lb. per Cwt. for Dirt.

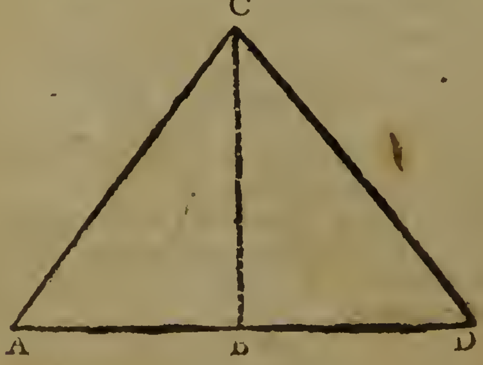
Land Measure.

Land is usually measured by the Acre. The Dimensions are taken with a Chain of four Poles in Length, which is divided into 100 Parts, called *Links*, and 10 square Chains make an Acre. Let them be 10 in Length, and 1 in Breadth, or 5 in Length and 2 in Breadth, *&c.* or 160 square Poles; but to find its Content (if not regularly square) it is generally divided into Triangles: Thus a Piece of Land of 4 Sides (if not square) may be divided into two Triangles, Pieces of 5 Sides into 3, and a 6-sided Piece into 4 Triangles, and so on.

To measure a Triangle.

Admit the longest Side of the following Triangle, *viz.* A D to be 76 Poles; and the perpendicular or dotted Line B C to be 30 Poles; multiply 76 (the Base) by 15, the Half of the Perpendicular B C, and it produces 1140: Or you may multiply the whole Perpendicular by Half the Base, (or longest Side) it will produce the same; which divided by 160, (the square Poles in an Acre) the Quotient gives the Content of that Piece of Land in Acres; and what remains multiply by 4, and divide by the same Divisor, and it gives Roods, *&c.*

The Perpendicular always is drawn from the opposite Angle to the Base, or longest Side, as in the following Figure.



The Operation.

76 The Base.
15 Half the Perpendicular.

16|0)114|0(7 Acres $\frac{2}{160}$.
112

2

All other Pieces of Land (for the most part) must be divided into Triangles, and when measured, their Contents added together.

Suppose an oblong Plat of Ground contains 35 Poles broad, and 185 Poles long, how many Acres is the Content?

Rule. Multiply the Length in Poles by the Breadth, and divide the Product by 160, (the square Poles in an Acre) and the Quotient will be the Answer in Acres.

The Work.

185 the Length.
35 the Breadth.

925
555

160)6475(40 Acres.
640

75

The Content 40 Acres, and 75 Poles; or almost 40 Acres and a half.

By

By the Four Pole Chain.

Example. There is a Plat of Ground that contains 16 Chains and 25 Links in Breadth, and 57 Chains and 30 Links in Length: what is the Content of that Piece of Land?

C. Link.
57,30 Length.
16,25 Breadth.

28650
11460
34380
5730

Ac. 93|11250 cut off 5 Places.
4

No Roods ,45000
40

Poles 18|00000 93 A. 0 R. 18 P. *Ans.*

Four Roods or Rods is 1 Acre, 40 Poles 1 Rood or Rod, so that one Rood or Rod is a Quarter of an Acre.

The above Chain, commonly called *Gunter's* Chain, contains 4 Statute Poles in 100 Links, so that any Number of Chains are no more than so many 100 Links, as 4 Chains are 400 Links, and 6 Chains 600 Links, &c. 160 Statute Poles are an Acre, each Pole being 16 Feet and an Half; therefore, in a square Chain there are 16 square Poles; and if you divide 160, the square Poles in an Acre, by 16, the square Poles in a Chain, the Quotient is 10, the square Chains in an Acre.

A square Chain contains 10,000 square Links (or 100 multiplied by 100) and therefore it follows, that an Acre contains 100,000 square Links.

To reduce Statute to Customary Measure.

According to the Statute made in the 33d of *Edward* the First, and another in the 25th of Queen *Elizabeth*, a Statute Pole is 16 Feet and a half long, but in divers Parts of *England* there are used Poles of 18, others of 21, and some of 24 Feet long, called Customary Measure, being in Use according to the Custom of the Place where they are taken.

To turn therefore one Sort of Measure into the other, admit Statute Measure to be turned into Customary, do thus: Multiply the Number of Acres, Roods, and Poles, Statute Measure, by the square half Yards, or square half Feet in a square Pole of Statute Measure, and divide the Product by the square half Yards, or square half Feet contained in the Pole of the Measure Customary, and the Quotient gives the Answer in the latter, in Acres, &c.

Example. In 172 Acres Statute Measure, how many Acres of 18 Feet to the Pole or Perch?

172 Statute Measure.
121 Square half Yards.

144)20812(144 Acres $\frac{76}{144}$ *Customary Measure.*

In a Statute Pole are 11 half Yards, which squared, make 121 square half Yards; and in a square Pole of 18 Feet, or 6 Yards, there are 144 square half Yards, &c. For the Remainder, work as before, *viz.* by multiplying it by 4, &c. and the next Remainder by 40, &c. So that the Answer is, that 172 Acres, Statute Measure, make 144 Acres 2 Roods, and 4 Poles of such Customary Measure.

An Example to the Contrary.

In 543 Customary Acres of 18 Feet to the Pole, how many Acres of Statute Measure, being 16 Feet and a half to the Pole?

543 Customary.
144 Square half Yards in a Customary Acre.

2172
2172
543

121)78192(646 Statute Acres.
726

55, &c.

The Remainder 26 multiplied by 4 produces 104, which not amounting to a Rood, should be multiplied by 40, their Product is 4160; which divided by 121, quotes 34 Perches, and 46 remains. So the Answer is, that 543 Customary Acres, of 18 Feet to the Pole, make 646 Acres 34 Poles, and $\frac{46}{121}$ of a Pole.

Note. Customary Acres, as well as Statute Acres, contain 160 square Poles or Perches; the Excess of Bigness is by the Bigness of the Pole.

Solid Measure

IS that of Timber, Stone, Digging, Liquids, &c. and the Rule for Working is to multiply the Length, taken in Inches, and the Breadth together, and then that Product, by the Depth or Thickness, and the last Product will be the Content in Cubic Inches, which if Timber or Stone, divide by 1728, (the Cubic Inches in a Solid Foot) and the Quotient gives the Content in solid Feet.

Example. If a Tree be 16 Feet long, and 18 Inches square, how many solid Feet doth it contain?

Multip. { 18   16
18   12
324   192 the Length in Inches.
324 Breadth and Thickness.
768
384
576
1728)62208(36 Feet.
5184.
10368
0

Solid Measure.
40 Feet of round } Timber is a Ton or Load.
50 —— of hewn }
1728 Inches is a Foot of Stone or Timber.
27 Feet is a Yard.
282 Inches is a Gallon of Ale or Beer.
231 Inches is a Gallon of Wine.

Suppose there is given an oblong Piece of Timber, whose Breadth is 2,25 Feet, and Thickness 1,64 Feet, and Length 36,5 Feet, how many solid Feet are contained therein?

2,25 Breadth.
1,64 Thickness.

900
1350
225

36900
36,5 Length.

184500
221400
110700

134,68500 *Answer* 134,685 solid Feet, or 134, $\frac{5}{8}$ nearly.

Of Timber Measure.

WHEN at any Time you would know the Content of a Piece of Timber by Common or Decimal Arithmetic, observe what follows, *viz.* The Tree being girted, and one fourth Part taken for the Side of the Square, multiply the Length of the Side of the Square in Inches into itself, and that Product by the Length in Feet; which last Product divide by 144: but if you multiply by the Length in Inches, then your Divisor must be 1728, and if any Thing remains, divide such Remainder by 12, and the Quotient will be the odd Inches.

Example.

Suppose a Piece of Timber 15 Feet long, and a Quarter of the Girt 42 Inches; what is the Content of that Piece?

The Work.

42 Inches in the Side of the Square.

42

84

168

1764

15 Feet in Length.

F. I.

144)26460(183-9 *Answer.*

144

1206

1152

540

432

108

12

144)1296(9 Inches.

1296

In this Example 1764 is multiplied by 15 in one Line; but it may be worked shorter by Decimals, thus:

Squared { 3,5 the Side of the Square 42 Inches.

3,5

175

105

12,25 the Product are Feet.

15 Feet the Length.

183,75 the Contents, or 183 Feet, $\frac{75}{100}$ or 183 Feet 9 Inches.

But this common Way of taking ¼ of the circumference for the Side of the Square, which is equal to the Content of the Circle in round Timber is erroneous, and gives the Solidity somewhat less than the true Content; but the true Way ay is to multiply half the Diameter into half the Circumence and then that Product multiply by the Length, which ide by 1728, and the Quotient is the Content. If you nnot come to measure the End of the Piece, you may ow the Diameter by this Proportion, *viz.* as 22 is to 7, so he Circumference to the Diameter. Or you may find the le of a Square of a round ece of Timber, by this le, *viz.* multiply 2821 by Inches of the Circumence, and cut off 4 Fires on the Right-hand of Product.

2821
Inch. 66 the Compass.

16926
16926

18|6186 *Ans.* 18 $\frac{6}{10}$ In.

Having the Breadth 24 Inches and Depth 18 of a Piece Timber or Stone; to know how much in Length of it will ke a solid Foot; multiply one with the other, and let the duct be a Divisor to 1728, thus:

24 broad.
18 thick.

192
24

432)1728(4 Inches in Length.
1728

Thus you may make a Table to serve all Breadths and pths, by which much Labour may be saved, and yet asure any Piece of Timber very exactly.

n Square Timber, you must make the Inches squared a visor to 1728, and the Quotient will be the Answer in hes of Length, that will make a Foot solid.

Example.

f a Piece of Timber be 8 Inches square, what Length of vill make a Foot?

64)1728(27
128

448
448

(0)

Answer, 27 Inches, or 2 Feet 3 Inches in Length.

Here the Square of 8 is 64, *&c.*

Again, Suppose a Piece be 18 Inches square, wl Length will make a Foot? *Answ.* 5 Inches and one third.

The Square of 18 is 324)1728(5 $\frac{108}{324}$ equal to $\frac{1}{3}$.
1620
(108)

The usual Way of tapering Timber, is by this Meth *viz.* take the Dimensions in the Middle, and multiply tl by the Length; which is not accurate, but if the Dime sions be taken in several Places, and the Means be used, t Content thus found will be near the Truth.

Digging

IS measured by the solid Yard of 27 Feet; that is, Times 3 is 9, and 3 Times 9 is 27, by which are measur Vaults or Cellars, Clay for Bricks, &c. Other Things a measured by the *Floor* of 324 solid Feet.

Example 1.

If a Vault or Cellar be 9 Feet deep, 4 Feet $\frac{1}{2}$ long, an Feet 9 Inches broad; what is its Content in solid Yards?

Feet.
$4\frac{1}{2}$ long.
9 deep.
$40\frac{1}{2}$
3 *F.* 9 broad
$121\frac{1}{2}$
6 Inches $\frac{1}{2}$ — $20\frac{1}{4}$
3 is $\frac{1}{2}$ of 6. — $10\frac{1}{8}$
27)$151\frac{7}{8}$(5 Yards, 16 Feet $\frac{7}{8}$
135
(16)

Example 2.

Iow many Yards of Digging will there be in a Vault that 5 F. 4 long, 15 F. 8 Broad, and 7 F. ½ deep.

Ft. *In.*
25—4
15—8

380—0
16--10—8

396--10—8
7—6

2778—2—8
198—5—4

Yd. Ft. In
27)2976—8—0(110—6—8.
297

6

Answer 110 Yards 6 Feet 8 Inches.

Example 3.

here is a Mote that is 648 Feet long, 24 Feet broad, and eet deep, how many Floors?

648 long.
24 broad.

2592
1296

15552
9

Divide by 324)139968(432 Floors. *Answer.*

&c.

(0)

olid Bodies being frequently painted, it is necessary to ow how to obtain the Superficies. To find the superficial ntent of a Square, or many sided, or round Pillar: Mul-y the Sum of the Sides or Circumference, by the

Height in Feet, and the Product, divided by 9, will square Yards.

Of a Globe.

Multiply the Circumference in Feet by itself, and then t Product by this Decimal 0,0353678, and this last Prod will be the Content in Yards.

To find the superficial Content of a Pyramid or Co (see Plate Fig. 7 and 8) multiply for the Pyramid, half Sum of the Sides, or for the Cone half the Circumferenc the Base, by the slant Height in Feet: and the Product vided by 9, will be square Yards.

If the Pyramid or Cone be not complete, that is, if I of the Top be wanting, add together the Circumference Top and Bottom, and half their Sum being multiplied by slant Height, will be the superficial Content.

Note. A solid Yard square of Clay will make about 7 800 bricks; 3 Bags (or Bushels) and half of Lime, and l a Load of Sand, will lay 1000 Bricks.

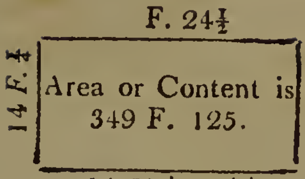
500 Bricks
1000 Plain Tiles } make a Load.
25 Bags 1 *C.* of Lime.

IT may not here be improper, as well for refreshing Memory, as for improving the Understanding and form the Mind with proper Notions and Ideas of Measuring, give a short Repetition by demonstrative geometrical gures, to explain what had been verbally and arithmetica before expressed.

And first for *Planimetry*, or *superficial*, or *flat Measu* Some of which is measured by the Foot square; as Boards, Glass, Marble, Freestone, and Pavements. T Dimensions are taken in Feet and Inches, and the Cont given in square Feet.

Example 1.

Suppose there is an Oblong, or long Square, let it Board, Glass or Pavement, &c. that contains on the long Side (or the Length) 24 Feet and a half, and the shortest S or Breadth, 14 Feet ¼, as in the following Figure, *viz.*



14,25 breadth.
24,5 length.

7125
5700
2850

349,125

Rule. Multiply the Length by the Breadth, and cut off as any Places to the Right-hand as there are Decimals in the ength and Breadth.

Example 2.

Suppose a Board or Piece of Glass be in the Form of Fig. Plate, called the Rhombus, that is in the Shape of a comon Pane of Glass, or Diamond Square.

Rule. To measure which let fall a Perpendicular at B, and ultiply it by the Length of any of the Sides (for they are all ual) and cut off as many Places to the Right-hand as there e Decimal Places in both Multiplicand and Multiplier, as nted before. Suppose the perpendicular Height to be Feet 38 Parts, and the Length of the Side to be 8 Feet, 52 rts, then the Work will appear thus:

F. P.
8,52
8,38

6816
2556
6816

71.3976

Here the Multiplication is as in whole Numbers, and the Content or Answer is found to be 71 square Feet, and $\frac{3976}{10000}$ of a Foot, or something more than 4 Inches ¼.

3976 is separated by a Comma, as above directed, and e so many 10,000 Parts of a Foot.

Example 3.

Again, admit a Piece of Measurement to be in the Form Fig. 2. called a Rhomboides; its Length C. D. 17 Feet Parts, and its Breadth A. B. 8 Feet 58 Parts.

F. P.
17,25 length.
8,58 breadth.

13800
8625
13800

148,0050 *Answer*, the Content is 148 Feet.

The forementioned Figur hath its opposite Sides equa and its opposite Angles alik

Once more.

Suppose a Board, Piece of Glass, Pavement, or Piece Land, to represent, or be in the Form of a Triangle, three cornered Figure, expressed as in the Shape of Fig. Every Triangle is half an Oblong, whose Length and Breadt are equal to the Perpendicular, and Base.

The dotted Line is the Perpendicular, the bottom Line th Base, and the Line from the Top of the Perpendicular A the left Angle of the Base C, is called the Hypotheneuse. AB be 10 Feet, and CD be 16 Feet, the Superficies of th Triangle will be 80 Feet.

Fig. 4. is called a Trapezium, and consists of 4 Sides This Figure before it can be measured, must be divided in two Triangles, thus; *viz.* by a Line drawn from one Ang or Corner, to the Angle opposite to it, as in the Figure. Th Line AB is called the Diagonal.

Rule. Multiply the Diagonal by half the Sum of the tw Perpendiculars falling upon it from the opposite Angles, an the Product will be the Area.

Example 4.

Suppose the Dimensions of the Trapezium before descri ed to be, viz. the Diagonal AB 16 F. 67; the one Perpe dicular D z 12 F. 50, and the other C x 9 F. 68, (as in Fi 5) what is the Content?

The Operation.

One Perpendicular 12,50 } add
The other 9,68 }

The Sum is 22,18

The half Sum is 11,09 which
multiply by the whole Base 16,67
produces 184,8703

which is 184 Feet, and $\frac{8703}{10000}$ of a Foot, equal to 10 Inch and a half.

If two Sides of a Trapezium are parallel, that is, equi-istant, then add them together, and half the Sum multi-lied by the nearest Distance, or a Perpendicular between ose two Sides, gives the Content. Or if you measure in e Middle between two Sides or Lines that are of equal ength, the Answer will be the same.

The Painting, Plaistering, &c. of irregular Pieces, in the orms of Triangles, or not, if divided as above, may be easured as before; and brought into Yards (if the Con-nt is to be so given in) by dividing by 9, as before ewn.

Of Regular Figures.

Figures that have more than 4 Sides are called Poly-ns, and those of them that have their Sides and Angles ual, called regular Polygons.

Regular Figures have their Names from the Number of eir Sides; thus a Figure having

Equal sides, is called a

- Trigon, or Equilateral Triangle.
- Tetragon, or Square.
- Pentagon.
- Hexagon.
- Heptagon.
- Octagon.
- Nonagon.
- Decagon.
- Undecagon.
- Dodecagon.

The Area of a Pentagon may be found by multiplying Square of its Side by the Number 1,7204774. Thus he Side of a Pentagon be 11 Feet, then the Square there-will be 11 Times 11, or 121 Feet.

```
Multiply     1,7204774
      by           121
             ---------
              17204774
             34409548
            17204774
            ----------
            203,1777654
            ----------
```

Therefore the Area of a Pentagon will be upwards of 208 square Feet.

In like Manner, to find the Area of the

Trigon,	Multiply the Square of the Side by	0,4330127
Tetragon,		1,0000000
Hexagon,		2,5980762
Heptagon,		3,6339124
Octagon,		4,8284271
Nonagon,		6,1818242
Decagon,		7,6942088
Undecagon,		9,3656404
Dodecagon,		11,1961524

Note. The Multipliers in this Table are the Areas of the Polygons to which they belong, when the Side is Unity or One. See Bonnycastle's Mensuration, 2d Edit. p. 55. Where the Demonstration is given at length.

Of a Circle.

Figure the Ninth.

A Circle is contained under one Line called the Circumference or Periphery; as *ABC*. Plate Fig. 9. All right Lines drawn from the Centre *E*, to the Circumference, are equal, and called Radii, or half Diameters: And the long Line through the Centre from *A* to *C* is the Diameter.

To divide a Circle into 6 equal Parts, extend the Compasses to half the Diameter, as from *A* to the Centre *E*, and the Extent applied to the Circumference will divide it into those Parts.

The Diameter *AC*. divides the Circle into two equal Parts, each of which is called a Semicircle; and if a Semicircle be divided into two equal Parts, those Parts are called Quadrants.

The Questions relating to the measuring of the Circle and its Parts may be solved as follows:

1. The Diameter being given to find the Circumference.

Rule. Multiply the Number 3,141597 by the Diameter, and the Product will be the Circumference. *Note.* The Number 3,1416 will be exact enough in most Cases.

Example. The Diameter of a Circle being 11 Inches, what is its Circumference?

$$\begin{array}{r} 3{,}1416 \\ 11 \\ \hline 3{,}1416 \\ 3{,}1416 \\ \hline \end{array}$$

Answer 34,5576 or something more than 34½ Inches.

2. The Diameter being given, to find the Area.

Rule. Multiply the Number 0,7853982 (or in Common Cases 0,7854) by the Square of the Diameter, and the Product will be the Area.

Example. What is the Area of that Circle whose Diameter is 11 Inches?

11 Times 11 is 121

$$\begin{array}{r} 0{,}7854 \\ 121 \\ \hline 7854 \\ 15708 \\ 7854 \\ \hline \end{array}$$

Answer 95,0334 Square Inches.

3. The Circumference being given, to find the Diameter.

Rule. Multiply the Number 0,3183099 (or in common 0,31831) by the Circumference, and the Product will be the Diameter.

Example. What is the Diameter of that Circle, whose Circumference is 34½ Inches, or 34,5

$$\begin{array}{r} 0{,}31831 \\ 34{,}5 \\ \hline 159155 \\ 127324 \\ 95493 \\ \hline \end{array}$$

Answer, 10,981695 (or almost 11) Inches.

4. The Circumference of a Circle being given, to find its Area.

Rule. Multiply the Number 0,0795775 (or in common, 0,0796)

0,0796) by the Square of the Circumference, the Product will be the Area.

Example. What is the Area of a Circle, whose Circumference is 34 ½ Inches?

```
    34,5              1190,25
    34,5                0,0796
   ------             --------
    1725               714150
   1380              1071225
  1035               833175
  ------             --------
  1190,25  Answer 94,743900 (or almost 95) square Inches.
```

5. The Area of a Circle being given, to find its Diameter.

Rule. Multiply the square Root of the Area by the Number 1,12837, and the Product will be the Diameter.

Example. What is the Diameter of that Circle whose Area is 95,0334 square Inches *?

```
         .  .  .
       95,0334)9,75 nearly.          1,12837
       81                               9,75
       ----                          --------
   187)1403                           564185
       1309                          789859
       ----                         1015533
     1945)9434                      ---------
          9725                      11,0016075
          ----                      ---------
```

Answer, The Diameter is 11 Inches.

* *Note.* Problems relating to the *Square Root* should be deferred till after the Reader has proceeded to that Subject a few Pages farther on.

6. The Area of a Circle being given, to find its Circumference.

Rule. Multiply the square Root of the Area by the Number 3,5449, and the Product will be the Circumference.

Example. What is the Circumference of that Circle whose Area is 95,0334 square Inches? The square Root of 95,0334(9,75 as before.

3,5449
9,75
177245
248143
319041
34,562775

Answer, The Circumference is something more than 34½ In.

7. To measure the Sector of a Circle. See Figure 10.

Case the First. If the Length of the Arc *DE,* and the Semidiameter *CE* be given.

Rule. Multiply the Length of the Arc by ½ the Semidiameter; and the Product will be the Area.

Case the Second. If the Number of Degrees contained in the Arc, and the Semidiameter be given.

Rule. Multiply the Square of the Semidiameter by the Number of Degrees contained in the Arc, and that Product by the Number, 0,0087267, and the Result will be the Area required.

Example. Let the Arc consist of 90 Degrees, or ¼ of the Circumference, and the Semidiameter be 3½.

3,5
3,5
175
105
12,25

12,25
90
1102,50

0,0087267
11025
436335
174534
872670
8,7267
9,62118675

Of Solid Measure.

SOLID or Cube Measure has been already defined, as well as superficial Measure, some of the Figures of which are numbered, 6, 7, and 8.

To measure a Solid in form of a Cube, which hath Length, Breadth, and Thickness all equal, you must multiply these into themselves; and the last Product gives the Solidity or Contents, of Wood or Stone, &c. A Cube hath six Sides, and is in Shape like a Dye.

Example.

What is the Solidity of a Cube whose Side is 12 Inches?

12
12
144
12
1728 the Solid inches in a Solid Foot.

To measure a solid of unequal Length, Breadth, and Thickness; multiply the Length by the Breadth, and the Product by the Height; the last Product will be the Solidity.

Example.

What is the Solidity of a Block of Marble, whose Length is 10 Feet; Breadth 5¾, and Depth 3½ Feet?

By Cross Mult.	By Decimals.	By Practice.
Ft. In.	5,75	5——9
5——9	3,5	3
3——6		6 is ½
	2875	17——3
17——3	1725	2—-10—6
2—-10—6		
	20,125	20——1—6
20——1—6	10	10
10		
	201,25 the Solidity.	201——3—0
201——3—-0		

The Cone is measured by finding the superficial Inches at the bottom or Base thereof; which multiply by One Third of the Inches in the Length, and that Product is the Solid Quantity in Inches; which Inches divide by 1728, and the Quotient gives the Answer in Solid Feet.

Example of finding the Solidity of the Cone, decimally, without dividing by 1728.

Let the Diameter of the Base be 2 Feet 6 Inches, and the Altitude 10 Feet 6 Inches.—The Area of a Circle is the Square of the Base multiplied by ,7854.

2,5 the Diameter.
2,5
125
50
6,25
,7854
2500
3125
5000
4375
4,908750

4,908750 Area of the Base.
3,5 Or Third of the Height.
24543750
14726250
17,1806250=The Solidity in Feet.

The Method will serve for tapering Timber or for any Conical Figures.

To measure a Pyramid.

Rule. Multiply the Area of the Base or Bottom by one Third of the Perpendicular Height, and the last Product will be the Content in Solid Feet: or one Third Part of the Area at the Base, multiplied by the whole Altitude, gives the Content also.

Examples of both Ways.

Suppose there is given a square Pyramid (or Figure like a Spire Steeple) the Side of whose Base is Four Feet and Half, and the Perpendicular Height 18 Feet; what is the Solid Content?

4,5
4,5
225
180
20,25
6 $\frac{1}{3}$ of the Altitude.
121,50 *Answer* 121 Feet, and $\frac{50}{100}$ or $\frac{1}{2}$.

6,75 $\frac{1}{3}$ of 20,250 the Area at the Base.
18 The whole Height.
5400
675
121,50 *Answer*, 121,50 as before.

When one Side of the Base is longer than the other, as admit one to be 2 F. $\frac{1}{2}$, and the other 1 F. $\frac{1}{2}$, then multiply the Length of the Base by the Breadth, and that Product by One Third of the Height as before.

If the Base be any Polygon, find its Area by the Rule given in page 193; and then multiply it by $\frac{1}{3}$ of the Height.

To measure the Frustrum or Segment, i. e. *a Piece or Part of a Pyramid whose Ends are similar regular Polygons.*

Rule. To the Areas of the two Ends of the Frustrum add the Square Root of their Product, and this Sum being multiplied by $\frac{1}{3}$ of the Height, will give its Solidity.

To measure the Frustrum or Segment of a Cone.

Rule. Divide the Difference of the Cubes of the Diameters of the two Ends by the Difference of the Diameters, and this Quotient being multiplied by ,7854, and again by $\frac{1}{3}$ of the Height, will give the Solidity.

Ex. What is the Solidity of the Frustrum of a Cone; the Diameter of the greater End being four Feet, and that of the lesser End two Feet; and the Height nine Feet.

4 2
4 2
16 4
4 2
Cube of 4. 64 Cube of 2. 8
8
Difference of the Diameters. 2)56 Difference of the Cubes of the Diameters.
28 *Note.* Multiply by 28.
,7854
62832
15708
21,9912
3 one third of the Cone's Height.
65,9736

Of

Of Gauging.

THERE is a near sort of Kindred or Affinity between the Art of Measuring Timber, and that of Gauging or Measuring Liquors; for both are performed by Cube or Solid Measure. For as often as there is found 1728 Solid or Cubic Inches in a Piece of Timber, (of what Form soever) so many Solid Feet it is said to contain: so likewise in the Art of Gauging, so many Times as 282 (the Solid Inches in a Beer or Ale Gallon) are found in any Vessel of such Liquor, so many Gallons is such a Vessel said to hold. And so of Wine; but in that the Divisor alters, it being 231 Solid or Cubic Inches, instead of 282.

And the Gallon of Dry Measure contains 272¼ cubical Inches.

Every cubical Foot in Beer or Ale-measure contains 6 Gallons and almost a Pint.

The same in Wine Measure is 7 Gallons, and almost 2 Quarts.

A cubical Foot of Dry Measure contains 6 Gallons and somewhat above one-third of a Gallon.

141 Inches make 2 Quarts of Beer or Ale, 70 Inches ½, one Quart, and 35 Inches ¼, a Pint.

Note. To find the Contents of any Vessel as a Box, that hath the Form of a Cube, that is, a Figure whose Breadth, Depth, and Length are all equal, and is very well represented by the Shape of a Dye commonly played withal.

Rule. Multiply the Side into itself, and then again that Product by the Side; which last Product, if for Beer or Ale, divide by 282, the Inches in a Beer or Ale-Gallon; and for Wine, Brandy, *&c.* by 231, the Inches contained in a Wine Gallon.

Example.

Suppose a Cube, whose Side is 79 Inches, I demand the Solid Content in Beer and Wine Gallons. *Answ.* 1748 $\frac{103}{282}$ Beer or Ale Gallons, or 2134 $\frac{85}{231}$ Wine Gall.

```
   79       282)493039(1748 Beer or Ale Gall.
   79           282
  ----         ----
  711           2110     231)493039(2134 Wine Gall.
  553           1974         462
  ----          -----        ----
  6241           1363         310
    79           1128         231
 ------         -----        ----
  56169           2359        793
 43687            2256        693
 ------          -----        ----
 493039 Cube Inches  103      1009
                               924
                              ----
                                85
```

To find the Content of a Parallelopipedon, which is a Solid Figure contained under six sides, of which the opposite are Parallel, and of the Form of Figure the 12th.

Rule. Multiply the Length by the Breadth, and that Product by the Depth; and then divide by 282 for Beer or Ale, and 231 for Wine.

Example.

Suppose the Length of a Chest to be 95 Inches, and the Breadth 62 Inches, and the Depth 23 Inches; what is the Content in Beer and Wine Gallons.

```
      95 Length
      62 Breadth    282)135470(480 110/282 Beer Gallons.
     ----
     190
    570
    -----
    5890
      23 Depth      231)135470(586 104/231 Wine Gallons.
   ------
   17670
  11780
  ------
  135470 Solid Inches.
```

To

To gauge a Back or square Tun.

Example.

Suppose its Length 112 Inches, Breadth 72 Inches, and its depth 48 Inches; what is its Content in Solid Inches, and also its Content in Beer Gallons?

112 Length.	282)387072(1372 $\frac{168}{282}$ Galls. *Ans.*
72 Breadth.	282 . . .
224	1050
784	846
8064	2047
48 Depth.	1974
64512	732
32256	564
387072 Solid Inches.	(168)

To bring these Gallons into Barrels, divide them by 36, the Gallons in a Barrel of Beer, thus;

36)1372(38	*Answer.* 38 Barrels and $\frac{4}{36}$ or $\frac{1}{9}$ of a Barrel; and the Remainder 168, is something above half a Gallon.
108	
292	
288	
(4)	

How to gauge a Copper, round Tub, or Cask.

If it be of equal Bigness both at Top and Bottom, find the Cube Inches that it contains, and then bring it into Gallons as before.

But if it be wider at the Top than the Bottom, or the contrary; then take the Width or Diameter of the Tub somewhat above the Middle, next to the broadest End, if it be taper; or find the mean Diameter thus: Suppose the Bung Diameter to be 26 Inches, and the Head Diameter of the Cask to be 23 Inches, the Difference between which is 3 Inches, Two-thirds of which make two Inches; which added to the Lesser of the two Diameters, makes 25 for the mean Diameter sought. Having the mean Diameter, proceed to find the Content in Solid Inches thus :—First square the mean Diameter, multiply that Square by 0,7854, and the Product will give the Content of the Liquor at one Inch deep, and this multiplied by the Length, will give the solid Inches in the Copper, Tub, or Cask.

Example.

Suppose the mean Diameter to be 72 Inches, and the Length 56 Inches.

72
72

144
504

5184 Square.
,7854

20736
25920
41472
36288

4071,5136 Content at one Inch deep.

4071,5136
56

244290816
203575680

228004,7616

The above-found Solid Inches 228004 brought into Gallons, make 808, and 148 Solid Inches remain, something above half a Gallon; in all 22 Barrels, 16 Gallons and ½ of Beer.

Again, admit the mean Diameter of a Cask of Wine to be 14 Inches, and the Length 72 Inches, what is the Con-ent in Wine Gallons?

14 ,7854
14 196

56 47124
14 70686
7854

196

153,9384
72

3078768
10775688

231)11083,5648(47,9
924

1843
1617 *Answer* 48 Gal. nearly

2265
2079

1866
&c.

The Content of a Spheroid may be found thus: multiply the Square of the shortest Diameter by the longest Diameter, and then divide by 538 for Beer Gallons, and by 441 for Wine Gallons.

Ex. Suppose a Spheroid whose shortest Diameter is 74 Inches, and the longest 125 Inches; what is the Content in Beer and Wine Gallons?

74
74

296
518

5476 the Square of the shortest Diameter,
125 the longest Diameter.

27380
65712

538)684500(1272 $\frac{164}{538}$ Gallons of Beer.

441)684500(1552 $\frac{68}{441}$ Gallons of Wine.

To find the Content of a Frustrum of a Spheroid: to twice the Square of the Bung Diameter, and once the Square the Head, and multiply that Sum by the Length: Then for Beer divide by 1077; and for Wine Gallons, divide by 882.

Ex. A Cask whose Bung Diameter is 23 Inches, Head Diameter 21 Inches, and Length 27 Inches, what is the Content in Beer and Wine Gallons?

23
23
529 Sq. Bung Diam.
2
1058
441
1499
27 Length.
882)40473(45 $\frac{783}{882}$.
3528
5193
4410
783

21
21
441 Sq. Head Diam.

1077)40473(37 $\frac{624}{1077}$.
3231
8163
7539
624

Answ. 46 Wine Gallons nearly; and something more than 37 $\frac{1}{2}$ Beer Gallons.

Th

The *Extraction of the Square and Cube Root, of great Use in Measuring, Gauging,* &c.

The Square Root.

1*st.* A Square Number ariseth from the Multiplication of a Number into itself, the Number so multiplied being called the Root; thus 4 multiplied by 4, produceth 16; for 16 is a square Number, and 4 is the Root thereof; so also 4 is the Square of 2, for twice 2 is 4; and 9 is the Root of 81, for 9 Times 9 is 81, *&c.*

2*dly,* To extract the Square Root of any Number, is to find another Number, which multiptied into itself, produces he Number given; and after the Root is found, such a Multiplication is a Proof of the Work.

3*dly,* Square Numbers are either Single or Compound.

4*thly,* All the Single Square Numbers, with their respective Roots, are contained in the following Table, *viz.*

Roots	1	2	3	4	5	6	7	8	9
Squares	1	4	9	16	25	36	49	64	81

5*thly,* When the Square Root of any Number less than 100 is required, and that Number is not expressed in the foregoing Table, then you are to take the Root of that Square Number in the Table, which is the least nearest to the given Number. Thus if the Square Root of 50 were required, then, since 49 is the nearest square Number in the Table, therefore its Root, 7, will be the Root of the given Number, nearly.

6*thly,* A Compound square Number, is that which is produced by a Number consisting of more Places than one, multiplied by itself, and is never less than 100; so 729 is a compound Square Number, produced by the multiplying 27 into itself, and 961 is the Square of 31.

7*thly,* The Root of any Number under 100 may be easily known by the foregoing Table of single Squares; but to extract the Root of a compound Number of several Places, observe the following Directions.

Example 1.

Let the Square Root of the Number 45796 be required.

1. Set a Point over the Place of the Units thus, $4579\dot{6}$,

and so successively over every second Figure towards th Left-hand, as thus, $45\dot{7}9\dot{6}$; and thus, $\dot{4}5\dot{7}9\dot{6}$. But in Decimals, you must Point from the Place of Units towards th Right-hand omitting one Place, as above: and if the Plac of Decimals are odd, affix a Cypher towards the Right-hand of them to make them even. Your Numbe thus prepared, draw a crooked Line on the Right of th Number, as in Division; and, indeed, the Operation of th Square Root is not much unlike Division, only there the Divisor is fixed, and in the Square Root we are to find a nev Divisor for each Operation. I say, having made a crooke Line thus, $\dot{4}5\dot{7}9\dot{6}$ (seek in the foregoing Table for the nearest Square to the first Point on the Left-hand, which here i 4, the Root of which is 2, which Root place on the Right-hand of the crooked Line, and set its square 4 under the said Point as below:

$$\begin{array}{l} \dot{4}5\dot{7}9\dot{6}\ (2 \\ 4 \\ \hline (0) \end{array}$$

Then subtract it, and there remains 0: To the Remainder, bring down the next Point 57 thus:

$$\begin{array}{l} \dot{4}5\dot{7}9\dot{6}\ (2 \\ 4 \\ \hline 057 \end{array}$$

Which call the Resolvend; then double the Root of the first Point, and place it on the Left-hand of the Resolvend. thus:

$$\begin{array}{rl} & \dot{4}5\dot{7}9\dot{6}\ (2 \\ & 4 \\ \hline 4) & 057 \end{array}$$

Call the 4, the Double of the Root 2, thus placed on the Left-hand of the crooked Line, the Divisor, and seek how often 4, the Divisor, can be taken in 5, the first Figure of the Resolvend 57 (for you are to omit the last Figure towards the Right-hand) which here is once, place 1 to the

Right of the Root 2, and also to the Right of the Divisor 4, thus :

```
       .   .   .
       45796 (2
       4
       ---------
   41) 057
```

Then multiply the Divisor (now 41) by the Figure last placed in the Root, *viz.* 1, place it under the Resolvend, and subtract it therefrom.

```
        .  .
       45796 (21
       4
       ---------
   41) 057
        41
       ---
        16
```

Then bring down the next Point, *viz.* 96, and place it on the Right of the Remainder 16, for a new-Resolvend, or Dividend, : next double the Quotient, or Part of the Root, *viz.* 21, and Place it for a new Divisor to the new Resolvend 1696, thus :

```
       .   .   .
       45796 (21
       4
       ---------
   41) 057
        41
       ---
   42) 1696
```

Then seek how oft 42 in 169? (still reserving or omitting the Unit Figure of the Resolvend or Dividend as aforesaid) and I find I can have it 4 Times, which 4 I place in the Quotient and in the Divisor; and proceeding as before, the Work will appear thus:

        . . .
        45796 (214 Root.
        4
        ———
41) 057 Resolvend.
        41
        ———
424) 1696 Resolvend.
        1696 Product.
        ———
        (0)

In this last Operation, I place 4 in the Root, and likewise in the Divisor 42, which makes the new Divisor 424, to the Resolvend 1696; which Divisor multiplied by 4, the Figure placed in the Root, produces 1696; equal with the Dividend or Resolvend aforesaid, as in the Operation may be seen. Therefore the Square Root of 45796, is 214; for 214, multiplied into itself, produces 45796, the Numbe whose Square Root was sought.

Example 2.

                                    . . . .
What is the Square Root of 12299049 (3507 the Root.
                                    9
                                    ———
1st Divisor 65) 329 Resolvend.
                325 Product.
                ———
2d Divisor 700) 490 Resolvend.

There it is evident 49 cannot be divided by 70, I, of course put down an 0 in the Divisor, and also in the Root, and bring down the next Point.

3d Divisor 7007) 49049 Resolvend.
                 49049 Product.
                 ———
                 (0)

Exampl

Example 3, performed Decimally.

160,000000(12,649 Root.
1

st Divisor 22) 060
44

d Divisor 246) 1600
1476

d Divisor 2524) 12400
10096

th Divisor 25289) 230400
227601

2799

When the Divisor cannot be had in the Resolvend, ien place a Cypher in the Quotient, and also on the Right f the Divisor, and then bring down the next Square, &c. s in the second Example above may be seen.

If any Remainder happen to be after Extraction, you may roceed by annexing Pairs of Cyphers to the Right of the iven Number, and thus come to what Exactness you lease.

Such Numbers given for Extraction that leave Remainers, are by some called *Irrationals*, because their Roots canot be exactly discovered, but still there will be something emain, though you Work by whole Numbers or Fractions: s in the Example above, where the Remainder is 2799: or here you may proceed for ever and not come to an xact Root, because no Figure multiplied into itself will ive 0.

The Extraction of the Cube Root.

TO extract the Cube Root of any Number, is to find nother Number, which multiplied by itself, and that Prouct by the Number found, produces the Number given for xtraction.

All single Cube Numbers, with their respective Root are contained in the following Table.

Roots.	1	2	3	4	5	6	7	8	
Square.	1	4	9	16	25	36	49	64	8
Cube.	1	8	27	64	125	216	343	512	72

1*st*, To prepare any Number for Extraction, make Point over Unity, and so sucessively over every third F gure, towards the Left-hand in Integers, missing two between each Point; but in Decimals you must point fro the Place of Units to the Right-hand, *&c.*

Example.

Extract the Cube Root of 46656, prepared thus, as abov directed.

$4\dot{6}65\dot{6}$

Here are but two Points, therefore the Root will have bu two Places.

2*dly*, The Number being prepared, seek in the foregoin Table the nearest Root to the first Point or Period 46 which you will find to be 3, which Place in the Quotien thus, $4\dot{6}65\dot{6}$(3; the Cube whereof is 27, which place unde your first Period 46, as in the Margin; subtract it from 46, and there remains 19; this is your first Work, and no more to be repeated. Then to the Remainder 19, bring down the next Period, *viz.* 656 (which is the last) and place it on the Right of the Remainder 19.

$4\dot{6}65\dot{6}$(3
27
——
19

$4\dot{6}65\dot{6}$(3
27
——
19656 Resolvend.

Then draw a Line under the Resolvend; next square the 3 placed in the Quotient, which makes 9; which multiplied by 300 makes 2700 for a Divisor, which place accordingly thus:

$4\dot{6}65\dot{6}$(3
27
——
2700) 19656

Then seek how often 2 in 19, which will be found only
Times, because of the Increase that comes from the Quo-
nt, and place 6 in the Quotient: then multiply the Divi-
by 6, and the Product will be 16200; which place or-
rly under the Resolvend thus:

46656(36

27

2700) 19656

16200

Then proceed to find the Increase coming from the Quo-
nt thus: Square your last Figure 6, and it makes 36;
ich multiplied by three, the other Figure of the Quoti-
, it gives 108; which multiplied by 30, makes 3240.
is place also orderly under the last Number before set
vn, *viz.* 16200, and the Work will appear thus.

46656 (36

27

2700) 19656

16200

3240

Then cube the Figure last placed in the Quotient, *viz.* 6,
l it makes 216; which place orderly likewise under the
e 3240; add the three Lines together, and they make
56: which is equal to the Resolvend above, *viz.* 19656,
l there being no more Periods to bring down, I see the
rk is finished, and find the Cube Root of 46656 to
36.

This will appear to be true if the Root 36 be multipli by 36, and that Product by 36 again, for then the Resu will be 46656 as in the following Operation.

36
36

216
108

1296
36

7776
3888

46656 Proof.

The following Rule and Example will make the Subje less difficult.

Having separated the given Number into Periods, an from the first Period subtract the greatest Cube it contain put the Root as the Quotient, and to the Remainder brin down the next Period for a Dividend.

Find a Divisor by multiplying the Square of the Root b 300; seek how often it is contained in the Dividend, th Answer is the next Figure in the Root.

Multiply the Divisor by the last Figure in the Roo Multiply all the Figures in the Root by 30 except the las and the Product by the Square of the last. Cube th last Figure in the Root. Add these three last foun Numbers together, and subtract their Sum from the D vidend: to the Remainder bring down the next Perio and proceed as before.

Extract the Cube Root of 52313624.

```
                              .    .  .
   3                          52313624 (374 Root.
   3                          27
  ---                         -----
   9                          25313
   300                        23653
 ------                       -------
  2700                         1660624
     7                         1660624
 ------                       --------
 18900                         .......
  4410 = 3 × 30 × 49
   343 = 7 × 7 × 7
 ------
 23653
37 × 37 × 300 = 410700 Divisor.
                     4
                ---------
                1642800
                  17760 = 37 × 30 × 16
                     64 = 4 × 4 × 4.
                ---------
                1660624
```

Let the Reader try his Skill by answering the following uestions.

What is the Cube Root of 389017?—*Answ.* 73.

What is the Cube Root of 5735339?—*Answ.* 179.

What is the Cube Root of 32461759?

What is the Cube Root of 84604519?

Some Uses of the Square and Cube Roots.

1. *To find a mean Proportional between two Numbers.*

Rule. THE Square Root of the Product of the given umbers is the mean Proportional sought, so the mean oportional between 16 and 64, will be 32, for 16 multiied by 64 produces 1024, and the Square of 32 is also 24. This is the Use in finding the Side of a Square equal any Parallelogram, Rhombus, Rhomboides, Triangle, or egular Polygon.

2. *To*

2. *To find the Side of a Square equal to the Area of a given Superficies.*

Rule. The Square Root of the Content of any given Superficies is the Side of the Square. So if the Content of a given Circle be 160, the Side of the Square equal will be 12,649, &c.

3. *The Area of a Circle being given, to find the Circumference.* See Page 196.

4. *The Area of a Circle being given, to find the Diameter.* See Page 196.

5. *Any two Sides of a Right-angled Triangle being given, to find the third Side.*

This depends upon a mathematical Proposition, in which it is proved, that the Square of the Hypothenuse, or longest Side of a Right-angled Triangle, is equal to the Sum of the Squares of the Base and Perpendicular, that is, of the other two Sides.

Case 1. Let the Base or Ground *BA*. Fig. 13. represent the Breadth of a Moat or Ditch, and the Perpendicular *BC*. the Height of a Castle, Tower, or City-wall; and the Hypothenuse *AC*. the Length of a Scaling Ladder.

In this Figure the Base *AB* is supposed to contain 40 Yards; and the Perpendicular, or Height of the Tower or Wall, 30 Yards; what Length will the Hypothenuse *AC*, or Scaling Ladder be?

Rule. The *Square Root* of the Sum of the Squares of the Base and Perpendicular, is the Length of the Hypothenuse, thus:

1600 the Square of the Base 40.
900 the Square of the Perpendicular 30.

The Sum 2500 (50 Yards the Root or Length of the Scaling Ladder.
25
——
(0)

Case 2. If the Length of the Base or Breadth of the Ditch were required; then the Square Root of the Difference of the Squares of the Hypothenuse and Perpendicular is the Length of the Base, or Breadth of the Ditch or Moat, thus:

2500

2500 the Square of the Hypothenuse *AC*.
900 the Square of the Perpend. *BC*.

The Differ. 1600 (40 Yards the Root or Breadth of the Ditch.
16
(0)

Case 3. If the Height of the Tower or Perpendicular *BC* were required; then the Square Root of the Difference of the Squares of the Hypothenuse and Base, is the Height of the Perpendicular *BC*, thus:

2500　　900 (30 Yards.
1600　　9
900　　00

6. Any Number of Men being given to be formed into a Square Battalion, to find the Number of Rank and File.

Rule. The square Root of the Number of Men given, will be the Number of Men to be placed in Rank and File.

Example. Admit an Army of 32400 Men were to be formed into a square Battalion; the square Root of 32400 will be found to be 180, and so many Men must be placed in Rank, and also File.

7. To find the Side of a Square, Polygon, or the Diameter of a Circle, which shall be to any other given Square, similar Polygon, or Circle, in a given Proportion.

Rule. Since similar Surfaces are to each other, in a duplicate Proportion of their like Sides; therefore,
As the given Circle, Square or Polygon,
Is to the required Circle, Square or Polygon;
So is the Square of the Diameter, or Side of the first,
To the Square of the Diameter, or Side of the second.
Then the Square Root of the Result of the above Proportion will be the Diameter or Side required.

Ex. 1. There is a Circle whose Diameter is 11; what will the Diameter of that Circle be, whose Area is four Times the Area thereof?

Here 11 Times 11 is 121 : and
As 1——4——121
4
———
$\dot{4}8\dot{4}$ (22 the Answer.
4
———
42) 84
84
———

Ex. 2. There are two similar Polygons, whose Areas are as 9 to 25, and the Side of the lesser is 12 Yards ; what is the Side of the greater ?

Here 12 Times 12 is 144 ; and
As 9——25——144
25
———
720
288
———
9) 3600
———
$\dot{4}0\dot{0}$ (20 the Answer.
4
———
000

8. *The Uses of the Cube Root are to find out the Dimensions of similar Solids, as Globes, Cylinders, Cubes, &c.*

Rule. Since similar Solids are to each other, as the Cubes of the like Sides or Diameters ; therefore,
As the Content or Weight of a given Solid,
Is to the Content or Weight of another like Solid ;
So is the Cube of the Side, or Diameter, of the one,
To the Cube of the Side, or Diameter, of the other.
Then the Cube Root of the Result will be the Length of the Side or Diameter required.

Example 1.

If a Bullet that weighs 72*lb.* is 8 Inches in Diameter, what will be the Diameter of that Bullet that weighs 9*lb.* ?

ere the Cube of 8 is 512; and

```
As 72——9————512
                 9
              ————
         72) 4608(64
             432
              ————
              288
              288
              ————
```

Then the Cube Root of 64, *viz.* 4, is the Diameter re-
uired.

Example 2.

If a Ship of 100 Tons be 44 Feet long at the Keel, of
hat Length must the Keel of a Ship be that carries 220
ons?

Say, as 100 is to 220: So is the Cube of 44, *viz.* 85184,
187404,8; whose Cube Root is 57,226, the Length of
e Keel sought.

Example 3.

There is a Cubical Vessel whose Side is 12 Inches, and it
required to find the Side of a Vessel that holds three Times
much. Here the Cube of 12 is 1728, which multiplied

```
————————————————————— 3
                    ————
roduces ———————————— 5184
```

e Cube Root of which is 17,306 the *Answer* required, or
de sought.

An easy Rule to find the Length of the Masts of a Ship.

The Mast always bears a certain Proportion to the
eadth of the Ship; whatever be the Breadth of the Vessel,
ultiply it by 12, and divide the Product by 5, which gives
e Length of the Main-mast. Thus a Ship 30 Feet broad,
the widest Part, will have a Mast 72 Feet long. And a
ip 40 Feet broad will have a Mast 96 Feet high for
× 12 = 480 and 480 divided by 5 gives 96.

To find the Thickness of Masts.

The Thickness of the Masts is estimated by allowing one
ch for every three Feet in Length, accordingly a Mast
venty-two Feet long, must be Twenty-four Inches in
ameter.

THE CONSTRUCTION OF SOME USEFUL GEOMETRICAL PROBLEMS.

At a given Point near the Middle of a Right Line, to erect a Perpendicular.

Let *C D* (Fig. 14.) be the Line given; to have a Perpendicular erected on it from the Point *B*; with the Compasses (opened at a convenient distance) Place one Foot at the point *B*, and with the other make the two marks *E* and *F*, on each Side of *B*, and at equal Distances from it; then, with the same, or any other Distance in the Compasses, set one Point on *E*, and with the other describe the Arc *G G*; which being done, without altering the Compasses set one Foot at *F*, and with the other describe the Arc *H H*, crossing the former at the Point *A*; through which Intersection with a Ruler draw a Line from *A* to *B*, which will be Perpendicular to the Line *C D*.

2. *How to raise a Perpendicular at or near the End of a Line.*

This is effected several Ways; but I shall instance onl two, which are very easy.

1*st*. Suppose the Line *A B* (Fig. 15.) be given to raise Perpendicular near the End, *A*.

First open your Compasses to a convenient Distance; an set one Foot on the Point *A*; and with the other describ the Arc *F E D*; then with one Foot of the Compasses in *D* (they being kept to the same Distance) cross the Arc in *E* and then setting one Foot in *E*, with the other make the Ar *A F G*, crossing the first Arc in *F*. Again set one Foot i *F*, and with the other describe the small Arc *H H*, crossin the former in the Point *C*; so the Line *A C* being draw will be the Perpendicular required.

2*d*. Let *B* be the given Point on which to draw the Pe pendicular *B I*. Open the Compasses to any convenien Distance; and setting one Foot on the Point *B*, pitch dow the other Foot at Random, as suppose at *K*, then the Foo resting in *K*, turn the other about till it cross the Line *A* in *L*; then draw the Line *K L*, and continue the same b yond *K*, setting off the same distance *K L*, (at which th

Con

Compasses already stand) from *K* to *M*, so a Line drawn from *B*, though *M*, will be the Perpendicular required.

3. *How to divide a Right Line into two equal Parts.*

Suppose the Line *A B* (Fig. 16.) be given to be divided into two equal Parts. Take ~~in the Compasses~~ any Distance above half the Length of *A B*, and setting one Foot on the Point *A*, with the other draw the Arc *F D E*; then (with the Compasses unaltered) set one Foot in *B*, and with the other cross the former Arc both above and below the Line, in the Points *F* and *G*, then a Line drawn from *F* to *G* shall intersect, or cut the given Line in *H*, and divide the Line *A B* into equal Parts, *A H* and *D B*.

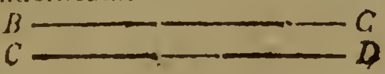
4. *A Line being given, how to draw another Line parallel thereunto, at any Distance required, or through any Point assigned.*

Of parallel Lines there are two Sorts, viz. *Straight* or *Circular*. And all Circles drawn on the same Centre, whether greater or lesser one than the other, are said to be parallel or concentric, that is having one common Centre.

In this Figure the Circle *A B C D* (Fig. 17) is concentric or parallel to the Circles *E F G H*, because both of them are drawn from the same Centre. The Line *A C* is the Diameter of the greater Circle, and the Line *E G* of the lesser Circle. And all right Lines drawn from the Centre to either of the Circumferences, are equal with respect to their Periphery; and such Lines are called half Diameters, and sometimes the Radius of the Circle, and will divide the Circle into six equal Parts, each containing 60 Degrees, and the whole Circle 360; into which all the great Circles of the Sphere are supposed to be divided.

Of Parallel Right Lines.

Right-lined Parallels, are Lines drawn on a Plane of equal Length and Distance; and though infinitely extended will never meet, and in all Parts retain an equal Distance such as these underneath.



To draw a Right Line parallel to another Right Line at a Distance given.

Take in your Compasses the given Distance *G H* (Fig. 18.) then setting one Foot in *E*, draw the Arc *I K*; then moving to *F*, describe the Arc *L M*; then laying a Ruler on the Top of the two Arcs, just touching them, draw the Line *N O*, which will be parallel to the given Line *E F*.

5. *Through any three Points (not in a straight Line) to describe a Circle.*

Let the Points given be *A*, *B*, and *C*, (Fig. 19.) through which it is required that a Circle be drawn. First, set one Foot of the Compasses in one of the given Points, as suppose in *A*, and extend the other Foot to *B*, another of the Points, and draw the Arc of a Circle *G F D*; then (the Compasses not altered) set one Foot in *B*, and with the other cross the said Arc with two small Arcs, in the Points *D* and *E*; and draw the Line *D E*. Thirdly, set one Foot in *C* (the Compasses being at the same Distance) and with the other Foot cross the first Arc *G F D* in the Points *F* and *G*, and draw the Line *F G*, crossing the Line *DE* in the Point *O*, which is the Centre sought for; in which, place one Foot of the Compasses, and describe the Circle at the Distance *O A*, and it will pass through all the given Points *A*, *B*, and *C*.

Another Method. Join the three Points, and bisect any two Sides of the Triangle, and on the Points of Bisection erect Perpendiculars crossing each other, and the Point of Intersection is the Centre of the Circle sought.

How to make the Line of Chords geometrically to any assigned Length or Radius.

Since in the Art of Dialling, there is frequent Use made of the Line of Chords, it is proper here to shew the making thereof.

A Line of Chords is 90 Degrees of the Arc of a Circle transferred from the Limb of the Circle, to a straight Line; now every Circle, whether great or small, is divided (or supposed to be divided) into 360 equal Parts, called Degrees; so the Semi-circle contains 180; the Quadrant or Quarter 90, and the Radius or Semi-diameter (which is that Line with which the Circle or Semi-circle is drawn or described) is always equal to 60 Degrees of that Circle which it describes, and therefore 60 Degrees of a Line.

To make the Line of Chords.

First draw a Line to any Length, *C B D* (Fig. 20.) and on the Middle thereof erect the Perpendicular *A B*; next open your Compasses to the Radius or Length that you would have your Line of Chords be of; which admit *AB*, and with that Distance on *B* as the Centre, describe or draw the Semi-circle *C A D* which is divided into two equal Parts or Quadrants by the Perpendicular Line *A B*: thirdly, divide the Arc or Quadrant *A D*, into 9 equal Parts, each of which will be 10 Degrees according as the Numbers are seen and set apart to them. The Quadrant *A D* being thus divided into Parts of 10 Degrees each, set one Foot of the Compasses in *D*, and open the Foot to 90, and describe the Arc 90 *A*, touching the Line *CD* in *A*, so is the Point *A* upon the right Line *CD*, the Chord of 90 Degrees. Open the Compasses from *D* to 80 Degrees, and describe the Arc 80 *b*; so shall the Point *b* be the Chord of 80 Degrees. Open the Compasses from *D* to 70, describe the Arc 70 *c*, *c* the Chord of 70 Degrees, and so of the rest, and then you will have the Line *DA*, divided into 9 unequal Parts, called Chords; as in Figure 20, and if the Quadrant be large enough, each of the Parts may be subdivided into ten others, in the same Manner, and then you have the Chords for 90 Degrees.

Thus much for the Line of Chords frequently made Use of in Dialling, where there is not the Conveniency of having a Mathematical Instrument Maker near at Hand.

Note, *A Degree is the 360th Part of the Globe, or of any Circle; and each Degree is supposed to be divided into 60 Parts, called Minutes; so that 45 Minutes is three Quarters of a Degree, and 30 Minutes half a Degree, and 15 Minutes one Quarter of a Degree.*

Instrumental Arithmetic.

AS Problems or Questions in Measurement, &c. are solved or answered arithmetically by the Pen, so are they Instrumentally taken by Compasses, from certain Lines, &c. or Rules made for that Purpose, for the Help of those that are deficient in Arithmetic, or for a quicker Dispatch of Business; and such Performances are called *Instrumental Arithmetic*; and of these Instruments, the most in Vogue or Use, are these three: 1. The Carpenter's Plain Rule: 2. *Gunter's* Line: 3. *Coggeshall's* sliding Rule.

The Carpenter's Plain Rule.

I shall describe and say something of the *Carpenter's Plain Rule,* in Relation to its Uses, *&c.*

Its Description.

This Rule is made Use of in measuring Boards and Timber, being two Feet in Length, and divided into twenty-four Parts or Inches; and every one of those Parts or Inches subdivided into half Inches, and each of those Halves into Quarters, and each Quarter into two Parts; so that every Inch is divided into eight Parts, and the whole Length into 192 Parts.

This Rule is well known, and therefore not absolutely necessary of Representation; but however, for the better understanding it, I shall give one thus:

Under Board Measure thus described.

1	2	3	4	5	6	1 7
12	6	4	3	2	2	
0	0	0	0	4	0	

This Line begins at 6, and goes on to 36, within 4 Inches of the Rule on the Right-hand.

Its Use.

	In. dp.	*Feet.*	*In.*	*Pts.*	
If a Board be	1	12	0	0	in Length make a Foot square.
	2	6	0	0	
	3	4	0	0	
	4	3	0	0	
	5	2	4	5	
	6	2	0	0	

By this Table it is manifest, and easily understood; that a Board of 4 Inches, requires 3 Feet in Length to make a Foot square, and a Piece of 3 Inches broad, will require 4 Feet in Length to make a Foot square, *&c.*

At the other End of this Rule is a Table called *Under* Timber Measure; and thus described,

1	2	3	4	5	6	7	8	
144	36	16	9	5	4	2	2	
0	0	0	0	9	0	11	3	

This Line begins at 8 and half, and goes on by Divisions to 36.

	In. Square	*Feet.*	
In a Piece of Timber of	1	144, 0	In Length make a Solid Foot.
	2	36, 0	
	3	16, 0	
	4	9, 0	
	5	5, 9	
	6	4, 0	
	7	2, 11	
	8	2, 3	

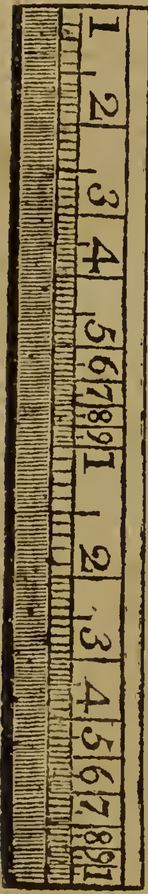
By this Table it is plain, that if a Piece of Timber is 6 Inches Square, then 4 Feet in Length of that Piece will make a Solid Foot.

It is a common Method with Carpenters to add the Breadth and Thickness of a Piece of Timber in Inches together, and call the Half thereof the Side of the Square of that Piece; but this Method gives the Content more than it is; and the greater the Difference the larger the Error. But the true Square may be found in *Gunter's Line*, thus: place one Point of the Compasses upon the Line at the Thickness, and the other at the Breadth; then Half of that Extent will reach, from either the Breadth or Thickness, to the Side of the true Square in Inches.

2. *Gunter's Line.*

This Line is commonly set on the Carpenter's plain Rule and consists of two Lines numbered 1, 2, 3, *&c.* one set at the End of the other, and it is somewhat of the following Form.

Gunter's Line.



To prove the Line by the Compasses observe that the

Distance from	1 to 2	is equal to the Distance from	2 to 4	&c.
	5 to 10		4 to 8	
	4 to 8		3 to 6	

To Number on Gunter's Line.

Observe, that the Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, sometimes signify themselves simply, or alone; at other Times 10, 20, 30, 40, *&c.* Again, at other Times, 100, 200, 300, or 1000, *&c.*

To find a Number on the Line, as suppose 134.

For the Figure 1, account 1 on the Line: and for 3, take 3 of the largest Divisions; and for 4 take 4 of the smaller Divisions; and that is the Point: Again, to find 750 on the Line: For 7 take 7 on the Line, for 50 take 5 of the great Divisions, and that is the Point.

To find a small Number on the Line; as suppose 12.

For 10, take 1 as before, and for 2 take 2 of the large Divisions, and that is the Point.

In measuring Boards or Timber it is best to have a Line of 2 Feet long, and Compasses 1 Foot long.

Note, Let the Measurement be by the Inch, Foot, Yard, Pole, Rod, *&c.* it is best to have it Decimally divided, or so supposed, that is, into 10th Parts.

Note also, That if one Point of the Compasses reach beyond the Line in the Work, remove the other Point to the same Figure or Place on the other Line.

Multiplication by Gunter's *Line.*

To multiply 5 by 7, set one Foot of the Compasses on it in the Left-hand Line, and extend the other to 5 upwards, or toward the Right-hand, and with the same Extent place one Foot in 7, and the other Foot will fall on 35 in the Right-hand Line, which is the Answer.

Division

Division in Gunter's *Line.*

Example 1. Divide 63 by 3; extend from 3 to 8 downwards, or towards the Left-hand, and the Extent will reach the same Way from 63 to 21 the Quotient.

N. B *In multiplying you must always extend upwards, that is, from* 1, *to* 2, 3, 4, &c. *and on the contrary, in dividing extend downwards.*

Example 2. Divide 288*l.* equally among 16 Men: Extend from 16 to 1 downwards; and that Extent will reach the same Way, from 288*l.* to 18*l.* for each Man.

Again.

Example 1. Suppose 750*l.* were to be divided among 25 Men: Extend from 25 to 1 downwards; and that Extent will reach the same Way, from 750*l.* to 30*l.* each Man's Share.

Rule of Three Direct.

Example 1. If 5 Bushels of Barley cost 11 Shillings, what will 40 Bushels cost? Extend from 5 to 11 upwards; and that Extent will reach the same Way, from 40 to 88, the Shilings required.

Example 2. If three Ells of Holland cost 10*s.* 6*d.* what will 40 Ells cost; extend from 3 to $10\frac{1}{2}$ upwards, and that Extent the same Way, will reach from 40 to 140*s.* the Answer.

The Use in Board Measure.

Example. If a Board be 9 Inches broad, and 19 Feet long, what is the Contents superficial square Feet? extend from 12 (the Centre of Foot Measure) to 9 downwards, and that Extent the same Way, will reach from 89 to 14 and $\frac{1}{4}$.

In Timber Measure.

Example. A Piece of Timber 24 Inches Square, and 8 Feet long, what is the Content in solid Feet? extend from 12 the Centre, to 24 upwards, and that Extent twice the same Way will reach from 8 to 32 Feet the Contents.

Brick Work.

How many Rods of Work are there in 4085 Feet? Extended from 272 downwards to 2, and that Extent the same Way from 4085, will reach 15 Rods, the Answer.

3. Coggeshall's *Sliding Rule.*

The next Instrument I shall speak of, is that which goes by the Name of *Coggeshall's Sliding Rule.* And first of

Its Description.

This Rule is framed 3 Ways; sliding by one another as the Glazier's Rule; sliding on one Side of a two Feet Joint-rule; and one Part sliding on the other, in a Foot of Length; the back Part being flat, on which are sundry Lines and Scales.

Upon the aforesaid sliding Side of the Rule, are four Lines of Numbers, three are double Lines, and one a single Line of Numbers, marked with *A B C* and *D,* the three marked *A B* and *C,* are called double Lines of Numbers, and figured 1, 2, 3, 4, 5, 6, 7, 8, 9. Then 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, at the End. That marked *D* is the single Line of Numbers, and figured 4, 5, 6, 7, 8, 9, 10, 20, 30, and at the End 40, even with and under 10, in the double Line next to it; and that is called the Girt Line, and so marked in the Figure.

The Figures on the three double Lines of Numbers, may be increased or decreased at Pleasure; thus 1 at the Beginning may be ealled 10, 100 or 1000; and 2 is 20, 200, or 2000; so that when 1 at the Beginning is 10, then 1 in the Middle is 100, and 10 at the End is 1000; but if 1 at the Beginning is accounted for 1, then 1 in the Middle is 10, and 10 at the End is 100.

And as the Figures are altered, so must the Strokes or Divisions between them be altered in their Value, according to the Number of the Parts they are divided into; as thus, from 1 to 2, it is divided into 10 Parts, and each Tenth is divided into 5 Parts; and from 2 to 3, it is divided into 10 Parts, and each Tenth into 2 Parts, and so on from 3 to 5; then from 5 to 6, it is divided into 10 Parts only; and so on unto 1 in the Middle of the Rule, or the End of the first Part of the double Line of Numbers. The second Part of the double Line is divided like the first.

The Girt Line marked *D,* is divided from 4 to 5 into 10 Parts, and each 10th into 2 Parts, and so on from 5 to 10; and then from 10 to 20, it is divided into 10 Parts, and each Tenth into 4 Parts; and so on all the Way from

20 to 40 at the End, which is right against 10 at the End of the double Line of Numbers.

The Lines on the Back-side of this Rule that slide on one Side, are these, *viz.* a Line of the Inch Measure from 1 to 12, each divided into Halves, Quarters, and Half-quarters; another Line of Inch Measure from 1 to 12, each divided into 12 equal Parts, and a Line of Foot Measure, being 1 Foot divided into 100 equal Parts, and figured 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100, even with 12 on Inch Measure.

And the Back-side of the sliding Piece is divided into Inches, Halves, Quarters, and Half-quarters, and figured from 12 to 24, so that it may be slid out to 2 Feet to measure the Length of a Tree, or any Thing else you have occasion to measure.

The Use of the double Scale.

Example.

Suppose there is a Geometrical Square, whose Sides are 3 Feet ½ each: set 1 Foot on the Line *B*, to 3½ on the Line *A*; and then against 3½ on the Line *B*, is 12 Foot ¼ on the Line *A*, which is the Content of such a Square.

F. Pts.
3—6
3—6

10—6 Arithmetically.
1—9

12—3 Proof.

Suppose the Side of a Rhombus be 8 Feet 6 Inches ¼, and the Breadth of the Line *A B* 8 *F.* 4¼, what is the Content? Set one Foot on the Line *B* to 8 Feet 52/100 on the Line *A*, then again 8 Feet 52/100 on the Line *B*, is 71 Feet 10/100 Parts of a Foot on the Line *A*, and to know the Value of the Decimal, or Part of the Foot, look for 10/100 on the Rule, and you will find against it 4 Inches ¼, so that the Content of this Rhombus is 71 Feet, 4 Inches ¼.

Again, suppose the Length of a Rhomboides to be 14 *F.* ⅔ or 17 25/100 and the Breadth 8 F. 7 or 8 15/100, what is the

Content? Set one Foot on the Line *B* to 17, 25 on the Line *A*, then against 8, 58 on the Line *B*, is 148 Feet on the Line *A*. The Figure hath been presented before and operated arithmetically, therefore it is here unnecessary.

Let the Base of a Triangle be 4 Feet 1 Inch $\frac{3}{4}$ and the Perpendicular 2 Feet $1\frac{3}{4}$; the Half of the one, in 2 Feet 7 Parts; and of the other 1 Foot 7 Parts. Set one on the Line *B*, to 4, 15 on the Line *A*; then against 1, 07 half the Perpendicular on the Line *B*, is 4 Feet and almost $\frac{1}{2}$ a Foot for the Content. Or if you set 1 on the Line *B* to 1, 07 on the Line *A*, against 4, 15 on the Line *B*, is 4, and almost $\frac{1}{2}$ Foot on the Line *A*.

Again another Way. If you set one on the Line *B* to 4, 1 on the Line *A*, then against 2, 25 on the Line *B* is 8 Feet $\frac{9}{10}$ (which is about 11 Inches) on the Line *A*, the Half whereof is 4 Feet 5 Inches $\frac{1}{2}$, which is the Content of the Triangle.

GEOGRAPHY.

GEOGRAPHY is the Art of describing the Surface of the Earth, the constituent Parts of which are Land and Sea.

Many Arguments may be produced to prove that the Earth and Seas are of a spherical or globular Figure; one of them may be sufficient in this Place, *viz.* that Ships in sailing from High Capes or Head Lands, lose Sight of the lower Parts first; and continue gradually also to lose Sight of those which are situate higher and higher, 'till at last the Top vanishes; which could not be unless the Surface of the Sea were convex; now this Convexity of the Sea is found to be uniform in all Parts thereof, therefore the Surface of the Waters is spherical; which being granted, that of the Land must be nearly so, because its Extremity sets Limits to the Waters.

The whole Body of the Earth and Seas is therefore called the Terraqueous Globe.

Since, as has been before observed, all Circles are divided into 360 Degrees, therefore any great Circle surrounding the terraqueous Globe, is usually so divided. Our ingenious Countryman, Mr. *Richard Norwood*, about the Year 1635, by an accurate Measurement of the Distance between *London* and *York*,, found that a Degree of a great Circle was about 69½ Statute Miles in Length, and consequently that the Circumference of the Terraqueous Globe was 25,020 Miles; whence its Diameter will be 7964 Miles.

The Sea covers the greater Part of the Terraqueous Globe, out of which the Land rises with very slow Ascents, the Height of the loftiest Mountains being Chimboraco in South America, and this is not quite four Miles Perpendicular above the Surface of the Sea.

Geographers have found it necessary to imagine certain Circles to be drawn on the Surface of the Earth, for the better Determination of the Positions of Places thereon.

These are either greater or lesser Circles; great Circles divide the Globe into two equal Parts, the lesser Circles divide it into two unequal Parts.

There are six Kinds of great Circles; two of them, viz. the Equator, or Equinoctial, and the Ecliptic, are fixed; but the others, viz. the Meridians, the Circles of Longitude, the Horizons, and the vertical Circles, are variable, according to the Part of the Globe they are appropriated to.

There are two Points on the Surface of the Terraqueous Globe, called the *Poles of the Earth*, which are diametrically opposite to each other; the one is called the *North*, and the other the *South Pole*.

The Equator is that great Circle which is equally distant from both the above-mentioned Poles, and is so called from its dividing the Terraqueous Globe into two equal Parts, named from the Poles which are situated in each, the Northern and Southern Hemispheres. It is also called the Equinoctial, because when the Sun enters it, the Days and Nights are of equal Length in all Parts of the Globe. Seamen commonly call this Circle the *Line*.

Meridians, or Circles of terrestrial Longitude, are supposed to be drawn perpendicular to the Equator, and to pass through the Poles: They are called Meridians, or Midday Circles, because when the Sun comes to the Meridian of any Place, it is Noon or Mid-day at that Place.

Hence every particular Place on the Surface of the Terraqueous Globe hath its proper Meridian, and consequently a Traveller who doth not directly approach to, or recede from one of the Poles, is continually changing his Meridian.

With respect to the two Circles above described, every Place upon the Earth is said to have its particular Latitude and Longitude.

The Latitude of any Place upon Earth, is its Distance from the Equator, in a Direct Line towards one of the Poles; and since the Meridians proceed in such a Direct Line, therefore Latitude is reckoned in Degrees, and Parts of Degrees, on the Meridians of the Place.

The Longitude of any Place upon Earth, is the East or West Distance of the Meridian of that Place, from some fixed Meridian, at which Longitude is supposed to begin. Now, since all the Meridians pass through the Poles, they coincide with one another at those Points, and their greatest Distance from each other will be, when they are farthest from those Points of Coincidence, *viz.* at the Equator; therefore, Longitude is reckoned in Degrees, and Parts of a Degree, of the Equator.

Geographers have differed very much in the Meridian, from whence they have assumed the Beginning of Longitude; the Ancients chose the Meridian of the *Canaries*, which they called the Fortunate Islands; others have pitched upon the *Azores*, or the Western Islands; but the most usual Way is now to reckon Longitude from the Capital of that Country in which an Author writes, and accordingly the Longitude is reckoned in this Work from the Meridian of *London*.

Parallels of Latitude are small Circles drawn parallel to the Equator at any assigned Distance therefrom; therefore every particular Place on the Surface of the Terraqueous Globe, hath its proper Parallel of Latitude.

There are four of these Parallels of Latitude that are particularly remarkable, *viz.* the two Tropics, and the two Polar Circles; but for the better Explanation of those Properties, it will be necessary, first, to define the Ecliptic.

The Ecliptic is that great Circle in which the Sun seems to perform its annual Motion round the Earth; this Circle makes an Angle with the Equator of 23° 29′; it intersects it in two opposite Points called the Equinoctial Points; and those two Points in the Ecliptic, which are farthest from the Equinoctial Points, are called the Solstitial Points.

The Tropic of Cancer is a Parallel of Latitude 23° 29′ distant from the Equator in the Northern Hemisphere, passing through the Northern Solstitial Point of the Ecliptic is before described: And,

The Tropic of Capricorn is a Parallel of Latitude, as far distant in the Southern Hemisphere, passing through the Southern Solstitial Point.

The Arctic Polar Circle is a Parallel of Latitude 23° 29′ distant from the North Pole; and the Antarctic Polar Circle is a Parallel of Latitude, as far distant from the South Pole.

The Tropics and Polar Circles divide the Globe into five Parts, called Zones; that is to say, Girdles or Belts; one of them is called the Torrid; two Temperate; and two, Frigid.

The Torrid Zone, so called from the great Heat of the Sun which passes directly over the Heads of the Inhabitants twice in a Year is situated between the two Tropics, and is therefore about 47 Degrees in Breadth; the Inhabitants are called *Amphicians;* that is such as have their shadows cast both Ways, the Sun being seen at Noon sometimes to the North, and at other Times to the South of them.

The Northern Temperate Zone is situated between the Tropic of *Cancer*, and the Arctic Polar Circle: and the Southern Temperate Zone, between the Tropic of *Capricorn*, and the Antarctic Polar Circle: They are each of them about 43 Degrees broad: The Inhabitants are called *Heteroscians*, that is, such as have their Shadow but one Way: for at Noon the Shadows of the Inhabitants of the Northern Temperate Zone, are always cast Northward; and those of the Inhabitants of the Southern Southward.

The Frigid Zones contain all that Space between the Polar Circles and the Poles themselves; the Northern Frigid Zone being surrounded by the Arctic Circle, and the Southern by the Antarctic. The Inhabitants are called *Periscians*, because, when the Sun is on the same Side of the Equator as those Inhabitants are, their Shadows are, in the Space of 24 Hours, cast of all Sides, or quite round them. The Sun does not set in the Places within these Zones, during several successive Revolutions or Days in the Summer: and in the Winter he doth not rise for a like Space of Time. To the inhabitants of the Poles, if there be any, the Sun is visible for half the Year, and invisible for the other half.

If any Place on the Globe, except the Poles and Equator,

tor, be particularly considered, there will be three othe Places on the same Meridian, which have more immediatel a Relation thereto, *viz.* 1. That Place which has the sam Latitude on the other Side of the Equator. The Inhabitant of this Place are called *Antœci*. They have Mid-day an Midnight at the same Time with those of the Place assumed; but the Seasons of the Year are different, the Summe of the one being the Winter of the other.

2. That Place, which is on the same Parallel of Latitude but is 180 Degrees different in Longitude. The Inhabitants of this Place are called *Periœci*. They have Summe and Winter at the same Times with those of the Place assumed; but the Times of the Day are different, the Mid-da of the one being the Mid-night of the other.

3. That Place, which has the same Latitude, on th other Side of the Equator, and is 180 Degrees different i Longitude. This Place is diametrically opposite to th Place assumed: Its Inhabitants are called *Antipodes*, and their Seasons of the Year, as well as Times of the Day, ar totally opposite.

The Horizon is that great Circle which divides the upper or visible Hemisphere of the World, from the lower or invisible, the Eye of the Spectator being always in the Centre of the Horizon. Hence every particular Place on the Terraqueous Globe hath a different Horizon; and consequently a Traveller, proceeding in any Direction, is continually changing his Horizon.

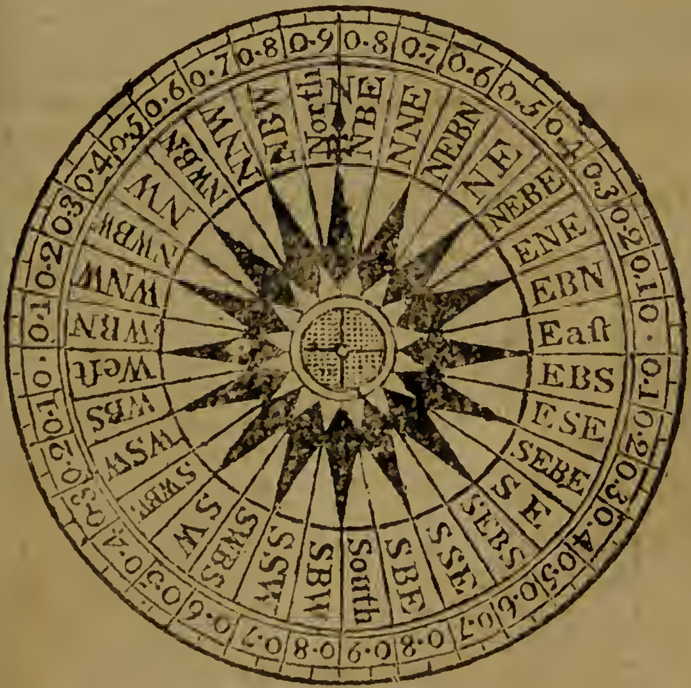
The Circle is, by Mariners, divided into four Quarters, containing 90 Degrees: The four Points quartering this Circle, are called Cardinal Points, and are named *East*, *West*, *North*, and *South*: The East and West are those Points on which the Sun rises and sets when it is in the Equinoctial; and the North and South Points are those which coincide with the Meridian of the Place, and are directed toward the North and South Poles of the World.

Each Quarter of the Horizon is farther divided into eight Points, which are very necessary to the Geographer, for distinguishing the Limits of Countries: but the Use of those Divisions is much more considerable when applied to the *Mariner's Compass*.

Before the Invention of this excellent and most useful Instrument, it was usual, in long Voyages, to sail by, or keep along the Coast, or at least to have it in Sight; as is manifest and plainly evident, by the Voyages of St. *Paul, Acts* xx. 13. and xxviii. 2. which made their Voyages long, and very dangerous, by being so near the shore. But now, by the help of a Needle, touched by the Magnet or Load-stone, which, by a wonderful and hidden Quality, inclines its Point always Northerly; the Mariner is directed in his proper Course of Sailing through the vast Ocean, and unfathomable Depths, to his intended Port; and, if the Wind is favourable, can sail more than 333 Leagues, or 1000 Miles, in a Week, through the darkest Weather, or darkest Night, when neither Land, Moon nor Stars, are to be seen, which before were the only Guide; and, if not seen, the Sailors were at a great Loss, and exposed to the most imminent Danger.

The following Figure is a Representation of the said Compass, with the Cardinal and other Points.

The Mariner's Compass.



The Compass in the preceding Page is a Representa-tion of the Horizon on a circular Piece of Paper called a Card, which Card being properly fixed to a Piece of Stee called the Needle, and placed so as to turn freely roun a Pin that supports it, will shew the Position of the Meridian, and other Points; and consequently towards which o them the Ship sails.

Note. The Letters *NBE, NNE, NEBN,* &c. are t be read North by East, North North East, North East b North, &c.

A Climate is a Space of the Terraqueous Globe containe between two such Parallels of Latitude, that the Length o the longest Day in the one exceeds that in the other by hal an Hour.

There are sixty Climates, thirty to the North, and thirt to the South of the Equator; twenty-four of each thirt being situate between the Equator and the Polar Circle differ in the Length of their longest Day by twenty-fou Hours; but in the remaining six, between the Polar Circle and Poles, the Differences of the Lengths of the longes Day are each a Month.

A Table of the Climates between the Equator and the Pola Circles.

Climate.	Longest Day.	Begins Latitude.	Ends Latitude.	Breadth.
1	12½ Ho.	0° - 0′	8° - 34′	8° - 34′
2	13	8 - 34	16 - 43	8 - 09
3	13½	16 - 43	24 - 11	7 - 28
4	14	24 - 11	30 - 45	6 - 34
5	14½	30 - 45	36 - 30	5 - 45
6	15	36 - 30	41 - 22	4 - 52
7	15½	41 - 22	41 - 31	4 - 09
8	16	45 - 31	49 - 01	3 - 30
9	16½	49 - 01	51 - 58	2 - 57
10	17	51 - 58	54 - 29	2 - 31
11	17½	54 - 29	56 - 37	2 - 08
12	18	56 - 37	58 - 26	1 - 49
13	18½	58 - 26	59 - 59	1 - 33
14	19	59 - 59	61 - 18	1 - 19
15	19½	61 - 18	62 - 25	1 - 07

Climate

Climate.	Longest Day.	Begins Latitude.	Ends Latitude.	Breadth.
16	20 Ho.	62° - 25′	63° - 21′	0° - 5′
17	20½	63 - 21	64 - 09	0 - 48
18	21	64 - 09	64 - 49	0 - 40
19	21½	64 - 49	65 - 21	0 - 32
20	22	65 - 21	65 - 45	0 - 24
21	22½	65 - 45	66 - 06	0 - 21
22	23	66 - 06	66 - 20	0 - 14
23	23½	66 - 20	66 - 28	0 - 08
24	24	66 - 28	66 - 31	0 - 03

A Table of the Climates between the Polar Circles and the Poles.

Climate.	Longest Day.	Begins Latitude.	Ends Latitude.	Breadth.
25	1 Month	66° - 31′	67° - 21′	8° - 50′
26	2	67 - 21	69 - 48	2 - 27
27	3	69 - 48	73 - 37	3 - 49
28	4	73 - 37	78 - 30	4 - 53
29	5	78 - 30	84 - 05	5 - 35
30	9	84 - 05	90 - 90	5 - 55

The Terraqueous Globe, or Globe of the Earth and Water, is divided by Nature, into Continents, Islands, Peninsulas, Isthmusses, Mountains, Promontories or Capes, Hills and Vallies; Oceans, Seas, Lakes, Gulphs or Bays, Streights, Ports or Harbours, and Rivers; Rocks, Shelves, Banks, Marshes and Bogs.

A Continent, called sometimes the Main-land, is a large Tract of Land, containing several contiguous Countries, Empires, Kingdoms, or States.

An Island is a Piece of Land wholly surrounded by the Ocean, Sea, or other Water, and so divided from the Continent.

A Peninsula is a Piece of Land, encompassed by Water, except on one Side, where it is joined to the Continent, or other Land.

An Isthmus is that neck, or narrow Piece of Land, that joins a Peninsula to the Continent.

A Mountain is a Part of the Earth, which is considerably higher, or more elevated than other Lands near it.

A Promontory is a Mountain running out into the Sea, the Extremity of which is called a Cape or Headland.

A Hill is a lesser Kind of Mountain; and a Valley is that Land which is situate at the Bottom of a Mountain or Hill, or between two or more Hills or Mountains.

The Ocean is a vast Body of Salt Water, which separates some of the Continents, and washes their Borders or Shores.

A Sea is a Branch of the Ocean flowing between some Parts of the Continents, or separating Islands from them.

A Lake is a Body of Water every where surrounded by the Land.

A Gulph or Bay is a Part of the Ocean or Sea contained between two Shores, and is encompassed by the Land, except on one Side, where it communicates with the other Waters.

A Strait is a narrow Passage whereby Seas, Gulphs, and Bays, communicate with the Ocean, or with one another.

A Port or Harbour is a Part of the Ocean or Sea so inclosed by the Land, that Ships may ride in safety therein.

A River is a running Water, descending in a narrow Channel from the Mountains, or other high Land, and emptying itself into some Ocean, Sea, Lake, or other River.

Rocks are great Stones; Shelves and Banks are Eminences consisting of Stones, Sands, or other Matter, which obstruct the Passage of Ships at Sea, and often prove fatal to those who do not keep clear of them.

Marshes are Lands lying low, which are liable to be overflowed by the Sea or Rivers; and Bogs are Mixtures of Land and Water, over or among which it is dangerous to attempt a Passage.

The known Parts of the Earth are commonly divided into four Parts, *viz. Europe, Asia, Africa,* and *America*; the first three were known to the Ancients, and are for that Reason called the Old World: the fourth was discovered something more than 300 Years ago, and therefore called the New World.

The Lands which lie towards the North and South Poles are very little known; that towards the North Pole is called *Terra Arctica,* and that towards the South Pole *Terra Antarctica,* or *Terra Australis Incognita*; the latter is supposed by some, to be nearly as big as *Europe, Asia,* and *'rica.*

The Ocean assumes different Names, in different Parts the Earth; and the Seas, Gulphs, and Bays are named ostly from the Lands to which they adjoin; it is thought erefore most convenient in this short Sketch, to describe e Land, and Waters together; and first of

EUROPE,

And the Adjacent Waters.

Europe is bounded on the North by the northern or ozen Ocean; on the West by the North *Atlantic* or estern Ocean, which separates it from *America;* on the uth by the *Mediterranean* Sea, separating it from *Africa;* d on the East, by *Asia,* to which it joins, without any ible Limit, towards the northern Parts; but on the uthern it is separated by various Rivers, Seas, *&c.*

The Length of Europe, from Cape St. Vincent to the alian Mountains, is about 3,300 Miles; and, the Breadth m Cape North in Lapland, to Cape Matapan in Greece, y be about 2,350 Miles.

Europe contains the following Empires, Kingdoms, Reons, or States, viz. *Spain, Portugal, France, Italy, Turkey, eat Britain,* the *Netherlands, Germany, Hungary, Poland, nmark, Sweden.* and the *Russian Empire.*

Of SPAIN and PORTUGAL.

Spain and *Portugal* are surrounded by the Sea on three les; on the South and South-east by the *Mediterranean,* nich communicates with the western or *Atlantic* Ocean, the Straits of *Gibraltar;* on the West by the said Ocean; d on the North, by the same or a Part thereof called the *y of Biscay:* on the North-east by the *Pyrenean* Mounns, which, reaching from the *Mediterranean* to the *Bay of scay,* separate it from France.

PORTUGAL is now a Kingdom, separate from *Spain,* to nich it was formerly subject: it is situate on the Ocean nich washes it on the West and South; it is hardly 300 les in Length from North to South, and about 100 in eadth. The Capital City is *Lisbon,* which was till lately in a ruinous Condition, having been almost totally destroye by an Earthquake, and a Fire which succeeded it in No *vember* 1755. The City of *Oporto* is also a Place of grea Trade, particularly famous for its Wine.

Most of the Provinces of SPAIN were all formerly sepa rate Kingdoms; such were *Andalusia*, in which *Gibralt* is situated, as are the Cities, of *Seville* and *Cadiz*; *Granad* within the *Straits*, the principal City has the same Name and on the *Mediterranean* are situated the Ports of *Malag* and *Almeria*, *Murcia* more Eastward in the *Mediterranea* in which besides a City of the same Name, is the City an Port of *Carthagena*: *Valencia*, North eastward of *Murcia* this has a City and Sea-port of the same Name, and anothe Port of great Trade called *Alicant*.

Spain now is divided into fourteen Districts, or Provinces, viz.

Asturia,
Biscay,
Navarre,
Galicia,
Leon,
Old Castile,
Arragon,
Catalonia,
Valencia,
New Castile,
Estramadura,
Andalusia,
Murcia,
and
Granada.

Its Chief Towns are Madrid, the Capital; Barcelon Seville; Corunna; and Cadiz, sometimes called Cale

The principal Rivers are the Ebro, the Tagus, and th Douro, all of which have their rise in Spain.

On a Promontory, in the South of Spain, stands Gibraltar, which has been in the Possession of the English for Century, and is so defended by Nature and Art as to b considered impregnable. Not far from Spain are th *Balearic Isles*, called *Majorca*, *Minorca*, and *Ivica*.

Proceeding eastward along the *Mediterranean Sea* is th Republic of *France*, which is bounded on the East by *Ital* *Switzerland* and *Germany*, on the North by the *English Cha* *nel*, on the West by the Bay of *Biscay*, and on the South b the *Pyrenees*. which separate it from *Spain*, and a Part of th *Mediterranean* Sea.

France was anciently divided into Provinces; but, sin the Revolution it has, with the Netherlands and vario other Territories, acquired by the War, been divided in one Hundred and Fifteen Departments, which are follow:

Ancient Prov.		*Departments.*	*Chief Towns.*
Provence	4	Basses-Alpes, Bouche-du-Rhône, Var, Vauclus	Digne, Aix, Toulon, Avignon
Dauphine	3	Hautes-Alpes, Drome, Iſère	Gap, Valence, Grenoble
Franche Compté	3	Doubs, Jura, Haute-Saone	Besançon, Lons-le Saunier, Vesoul
Alsace	2	Bas Rhin, Haut Rhin	Colmar, Strasbourg
Lorraine	4	Meuthe, Meuse, Moselle, Vosges	Nancy, Bas-sur-Ornain, Metz, Epinal
Champagne	4	Ardennes, Aube, Marne, Haute-Marne	Meziereres, Troyes, Chalons-sur-Marne, Chaumont
Les deux Flandres	2	Nord, Pas-de-Calais	Douai, Arras
sle de France	6	Aisne, Oise, Seine, Seine et Oise, Somme, Seine et Marne	Laon, Beauvais, Paris, Versailles, Amiens, Melun
Normandie	5	Calvados, Eure, Manche, Orne, Seine-Inferieure	Caen, Evreux, Coutances, Alençon, Rouen
Bretagne	5	Cotes-du Nord, Finisterre, Isle& Vilaine, Loire-Inferieure, Morbihan.	St. Brieux, Quimper, Rennes Nantes, Vannes
Haut&Bas Maine	4	Indre et Loire, Mayenne, Mayenne et Loire, Sarthe	Tours, Leval, Angers, Le Mans
oitou	3	Deux-Sevres, Vendée, Vienne	Niort, Fontenay le Peuple, Poictiers
rleanois	3	Eure et Loir, Loir et Cher, Loiret	Chartres, Blois, Orleans
erry	2	Indre, Cher	Chateauroux, Bourges
	50		

Ancient Prov.		*Departments.*	*Chief Towns.*
	50		
Nevernois	1	Nievre	Nevers
Valromey	4	Ain, Cote-d'or, Yonne, Saone et Loire.	Bourg, Dijon, Auxerre, Maço
Bourgogne	2	Loire, Rhone	Montbrison, Lyons
Bourbonnois	1	Allier	Moulins
Marche	3	Correge, Creuse, Haute-Vienne	Tulle, Gueret, Limoge
Angoumois	1	Charente	Angouleme
Aunis	1	Charente-inferieuse	Saintes
Pingord	1	Dordogne	Perigueux
Bordelois	4	Gironde, Landes Lot en Garonnes, Gers	Bourdeaux, Mo de-Marsan, Agen Auch
Quercy	1	Lot	Cahors
Rouergue	1	Aveyron	Rhodez
Bearn	1	Basses Pyrenées	Pau
Bigorre	1	Hautes-Pyrenées	Tarbe
Couserans	1	Arriegè	Tarascon
Rousillon	1	Pyrenèes Oriental	Perpignan
Languedoc	7	Ardeche, Ande, Gard, Haute Garonne, Herault, Lozere, Tarn	Privas, Carca sonne, Nîm Toulouse, Mo pelier, Menc Castres
Velay	3	Cantal, Haute-Loire, Poy-le-Dome	St. Fleur, Le Puy, Claremon
Corse	2	Golo, Liamone	Bastia, Ajaccio
Savoy	3	Mont-Blanc, Alpes Maritimes, Leman	Chambray, Nice, Geneva
Hainaut, Austrian Flanders, Brabant, Liege	9	Dyle, Escaut, Forets, Jemmapes, Lys, Meuse Inferieure, Deux Nethes, Ourthe, Sambre et Meuse	Brussels, Gan Luxembourg, Mons, Bruges, Maestricht, A vers, Liege, Namur
	98		

Anc

Ancient Prov.		*Departments.*	*Chief Towns.*
	98		
Countries between the Meuse and Rhine, the Rhine and Moselle	4	Roer, Sarre, Rhin et Moselle Mont-Tonnerre	Aix-la-Chapelle, Treves, Coblentz, Mayence
	102		

	102
St. Domingo -	5
Guadaloupe -	1
Martinique -	1
Guianne Cayenne -	1
Lucie et Tobago -	1
Granada -	1
Bourbon ou Reunion -	1
L'Isle de France -	1
Indes Orientales -	1
	115

Paris, the capital of France is, next to London, the largest d most considerable City in Europe. It contains, at this me, immense collections of Works of Art, ancient and odern. The other principal Towns of France are Lyons, arseilles, Bourdeaux, and Lisle.

The principal Mountains in France are the Alps, which ciently divided it from Italy; and the Pyrenées, which ide it from Spain.

The principal Rivers are the Rhone, the Garonne, the ire, the Seine, and the Somme. The Rhine forms the undary between France and Germany.

The Canals in France are very numerous; the chief ork of this Kind is the Canal of Languedoc, about one ndred and Eighty Miles in Length.

Near Toulon are the Isles of Hyeres, which are the same Homer's Isle of Calypso. On the western Coast is the e of Oleron. The Isle of Rhê is opposite Rochelle. llisle has been repeatedly attacked by the English. The e of Ushant is the most westerly headland in France.

taly is divided from *France* on the West by Part of the ps; from *Germany* on the North, by the same Mountains led the Alps; and is every where else surrounded by the *Mediterranean* Sea, and the Gulph of Venice, which a branch thereof.

It is divided into the Italian Republic; the Kingdom Etruria; the Roman States; and the Kingdom of Naples.

The Appenines form a grand Chain of Mountains, whic runs through almost the whole Extent of Italy. Mount V suvius, near Naples, is a celebrated volcanic Mountai But Vesuvius, compared with Etna in Sicily, is only small Hill; the Circuit of Vesuvius is thirty Miles, that Etna is one Hundred and eighty. The ashes of Vesuvius a sometimes thrown seven Miles, but those of Etna are fr quently thrown thirty.

Rome is the principal City of the Pope's dominio and the Capital of Italy. Florence is the Capital of Etruri and is ~~now~~ regarded as the Athens of modern Italy. Mil is the Capital of the Italian Republic.

Sicily, the largest of the Italian Islands, is separated fr the South-west Part of Naples by the Strait of Messi This Strait was famous for the Scylla and Charybdis of t Ancients, the former being a Rock, the latter a Whirlpo both very dangerous to the Navigators of that Peri The chief Towns are Palermo, Messina, and Syracu The Sovereign is sometimes stiled King of Naples, a sometimes the King of the Two Sicilies. *Sardinia* anot large Island, is situated almost in the Centre of the Medit ranean; the principal Town is Cagliari. *Corsica* is se rated from the northern Parts of Sardinia by the Strai Bonifacio; its chief Town is Bastia. The Island *Malta* lies about sixty Miles South of the Island of Sic and is celebrated for the Strength of its Fortifications.

Candia, to the South of Greece, is famous for Mount I Both Malta and Candia are renowned for withstand Sieges by the Turks, who in the former lost thirty Thous Men, and in the latter one Hundred and eighty Thousan

Rhodes, N. E. of Candia, is famous for its collossal Sta between the Legs of which Ships sailed into the Harb In its Right-hand was a Light-house for the Directio Mariners. It was destroyed by an Earthquake.

The principal Rivers are the Po, the Tiber, the Var, the Adige.

GERMANY is divided into Nine great Divisions, ca Circles: three northern, Westphalia, Lower Saxony, Upper Saxony: three in the Middle, Lower Rhine, Up Rhine, and Franconia: and three southern, Swabia, B ia, and Austria. These Circles are subdivided into Prinipalities, Duchies, Electorates, Bishoprics, &c. Besides iese there are a Number of Free Cities, which are Soveeign States; and some of them are stiled Imperial Towns, nd quarter the Imperial Eagle in their Arms.

The Emperor is elected, by ten Electors, for Life, under he Title of Emperor of Germany and King of the Romans. The present Emperor is also, in his own Right, Archduke f Austria, and King of Bohemia. The ten Electors are the King or Elector of Bohemia; the Elector of Bavaria; the Elector of Saxony; the Elector of Brandenburgh (King of Prussia); the Elector of Hanover; the Elector Archi-Chanellor of the Empire, whose Residence is at Ratisbon; the Elector of Saltzburgh; the Elector of Baden; the Elector f Wurtemburgh; and the Elector of Hesse.

The Electors of Saxony and Hanover are regarded as the rincipal Potentates in the North of Germany; the Elector f Bavaria, and the Elector of Wurtemburgh in the South. Prussia and Austria are considered as Independent Powers. Almost every Prince in Germany, of which there are about wo Hundred, is arbitrary in the Government of his own Estate; but together they form a great Confederacy, governed by political Laws. The Head of these petty Soereigns is the Emperor.

The Chief Towns are Vienna, the Residence of the preent Emperor; Dresden, the Residence of the Elector of Saxony, famous for its Gallery of Pictures, its various Colections in the Fine Arts, and its Porcelain Manufactory; Berlin, which is the Capital of the Prussian Dominions; Hamburgh, situated on the Elbe, and one of the first comnercial Cities in Europe; Leipsic, and Frankfort, famous or their Fairs; Gottingen, Jena, Leipsic, and Halle, celerated for their Universities; besides Hanover, Munich, Manheim, Wurtemburgh, Heidelburgh, Augsburgh, Contance, and Prague.

The principal Rivers of Germany are the Danube, the Rhine, the Main, and the Elbe.

The AUSTRIAN DOMINIONS.

THE Austrian Dominions comprehend Austria, Bohemia, Hungary, Part of Poland, with the Venetian States. By the Partition of Poland, Austria acquired one-sixth Part of hat Country, and more than four Millions of Subjects.

The Capital of this Empire is Vienna, where the Emperor is regarded as the successor to Augustus: in the other Provinces he is looked upon as the nominal King of Hungary and Bohemia. The other chief Towns are Venice, Prague, Presburg, Buda, Cracow and Trieste.

The principal Mountains are the Tyrolese, the Alps, and the Carpathian Mountains.

As there are in *Germany* several free Cities, which are small Commonwealths under the Protection of the Germanic Body, such as *Ratisbon, Frankfort, Hamburg,* &c. So among the Alps there are other small Commonwealths, commonly known by the Name of the *Swiss Cantons.*

SWITZERLAND, remarkable for its Mountains, is divided into thirteen Cantons, Zurich, Berne, Underwalden, Zug, Schweitz, Basil, Glasis, Soleure, Uri, Appenzel, Lucerne, Fribourg, and Schaffhausen. The three principal Towns are Basil, Berne, and Zurich.

The sources of the Rhine and the Rhone, two of the grandest Rivers in Europe, are to be found in the Mountains of Switzerland. The Lakes of Constance and Geneva have been long celebrated for their Beauty. The Alps, which divide Switzerland from Italy; the Mountains of St. Gothard, in the Canton of Uri; and Mont Blanc, on the Borders of Savoy, are the highest in Europe.

Denmark and *Norway,* two Kingdoms under the same Sovereign, are bounded on the North and West by the Ocean, on the South by Part of *Germany,* and the *Baltic* Sea, and on the East by *Sweden*; the Capital of *Denmark* is called *Copenhagen,* and that of *Norway, Christiana.*

On the Coast of *Norway* is the *Maelstroom,* a Whirlpool of great Extent, and very dangerous to Ships that approach it.

Greenland and the *Ferroe Islands* are subject to Denmark; and so is Iceland, celebrated for the burning Mount Hecla, a Volcano a Mile high.

Sweden has *Denmark* on the West, the *Baltic* Sea on the South, *Russia* on the East, and the Ocean on the North. It includes the greatest Part of ancient Scandinavia, and is divided into Sweden Proper, Gothland, Finland, Swedish Lapland, and the Swedish Islands.

The chief Towns are Stockholm, the Capital, which stands on seven Rocky Islands, united by Bridges; Upsal, Gothenburg, Tornea and Abo.

Russia has Part of *Sweden* and the *Baltic* Sea on the Vest, *Crim Tartary* on the South; *Great Tartary* in *Asia* on he East, and the Ocean on the North.

This vast Empire comprehends in Fact all the northern arts of Europe and Asia, but only a small Part of its Inabitants are in a State of Civilization. By the Partition of oland, Russia has acquired two-thirds of that Country, and x Millions of Inhabitants.

The principal Towns are Petersburgh, the Capital; Moscow; Archangel; Cherson; Astrachan; and Tobolsk. he chief Rivers, the Wolga; the Don; the Nieper and eister.

More to the eastward is *Turkey* in *Europe*, which consists f many Provinces, and includes ancient *Greece*, *Constantiople* in the eastern Part thereof, being the Residence of the rand Seignior, the Sovereign of this Empire.

The northern Provinces are Moldavia, Bessarabia, Valachia, Servia, Bosnia, and Dalmatia; those in the Midle are Bulgaria, Romania, Macedonia, Albania, and Epiis; the southern Part, called Greece, contains Thessaly, chaia, and the Morea. The famous City of Delphos was the District of Achaia; but it is now reduced to a mean illage called Castri.

The Metropolis of Turkey, Constantinople, is finely tuated between the Sea of Marmora and the Black Sea. drianople is the second City in the Turkish Empire.

The principal Rivers are the Danube, the Save, and the eister. The chief Mountains are Pindus and Olympus, hich separate Thessaly from Epirus; Parnassus in Livaia; Athos, and Hæmus. The Islands are very numerous, e chief are Rhodes, and Candia, in the Mediterranean; ere are also Zante, Cephalonia, Corfu, and others, lying Vest of Turkey, forming the Republic of the Seven Islands.

The UNITED KINGDOM of GREAT BRITAIN and IRELAND.

THIS being our native Country, we shall be alittle more articular in the Description of it.

The Island of Great Britain is divided into England, Vales, and Scotland. It is about six Hundred Miles in ength, and Half as broad, and is known to contain about velve Millions of Inhabitants.

England contains forty Counties or Shires, situated in the following Order, taken from North to South.

Counties.	*Chief Towns.*	*Counties.*	*Chief Towns.*
Northumberland	Newcastle	Buckinghamsh.	Aylesbury
Durham	Durham	Northamptonsh	Northampton
Cumberland	Carlisle	Bedfordshire	Bedford
Westmoreland	Appleby	Huntingdonsh.	Huntingdon
Yorkshire	York	Cambridgesh.	Cambridge
Lancashire	Lancaster	Norfolk	Norwich
Cheshire	Chester	Suffolk	Bury
Shropshire	Shrewsbury	Essex	Chelmsford
Derbyshire	Derby	Hertfordshire	Hertford
Nottinghamshire	Nottingham	Middlesex	London
Lincolnshire	Lincoln	Kent	Canterbury
Rutland	Oakham	Surrey	Guildford
Leicestershire	Leicester	Susrex	Chichester
Staffordshire	Stafford	Berkshire	Reading
Warwickshire	Warwick	Hampshire	Winchester
Worcestershire	Worcester	Wiltshire	Salisbury
Herefordshire	Hereford	Dorsetshire	Dorset
Monmouthshire	Monmouth	Somersetshire	Wells
Gloucestershire	Gloucester	Devonshire	Exeter
Oxfordshire	Oxford	Cornwall	Launceston

We shall give a brief Account of some of the principa Cities and Towns in England, without any particular Regard to the Order of Arrangement.

LONDON, the Metropolis of England, is perhaps the mos populous, and richest City on the Face of the Earth; including Westminster and Southwark, it may perhaps b deemed three Cities.

London taken in this Extent, presents almost every Variety which diversifies Human Existence. Towards th East, it is a Sea-port replete with Mariners, and with Trade connected with that Profession. In the Centre it is the Sea of numerous Manufactures, and prodigious Commerce while the Western or Fashionable Extremity presents Roya and Noble Splendour, amidst Scenes of Luxury and Dissipation. This City is supplied with Water by th Thames, the Water of which is thrown into the Houses, b Machinery erected at London Bridge; and by the Ne River which flows from Ware in Hertfordshire. Th higher Parts of London towards Mary-le-bone have thei

Wate

Water from a Number of large Ponds situated on Hampstead Heath.

YORK is the next City to the Capital in Dignity, though not in Extent, nor in Opulence; it is regarded as the Metropolis of the North of England. The Cathedral of this City is greatly celebrated; the Western Front being peculiarly rich, the chief Spire very lofty, and the Windows of the finest Painted Glass.

LIVERPOOL approaches now the nearest to London in Wealth and Commerce. It is only about a Century ago when this immense Town was a mere Village. In 1699 it was constituted a Parish, in 1710 a Dock was constructed, and the chief Merchants came originally from Ireland. The infamous Traffic in Slaves is a distinguishing Feature of Liverpool, it is there that from 100 to 150 Ships are constantly employed in this Trade. In a single Year during the American War, Liverpool fitted out 170 Privateers.

BRISTOL is still a large and flourishing City, though much of its Commerce with the West-Indies and America have passed to Liverpool. Bristol is famous for its Hot-Wells. In the adjacent Rocks are found beautiful Crystals, called Bristol Stones. The Trade of Bristol is chiefly with Ireland, the West Indies, or North America, Hamburgh, and the Baltic. By the Navigation of the two Rivers, the Severn and the Wye, Bristol engrosses most of the Trade of Wales. In 1787 Bristol employed 1600 coasting Vessels, and upwards of 400 Ships engaged in foreign Commerce.

MANCHESTER is celebrated for its Cotton Manufactures which are known and prized in every Part of Europe.

BIRMINGHAM was originally a Village, but is now a Town of immense Manufactures in the Iron Ware. The extension of Birmingham originated in a great degree from Mr. John Taylor, who introduced the Manufacture of Gilt Buttons, and japanned and enamelled Works. The great Fabric of the Arts, called Soho, belonging to Messrs. Boulton and Watts is situated about two Miles from Birmingham.

SHEFFIELD is famons for its Cutlery and Plated Goods.

LEEDS, BRADFIELD, HALIFAX, and WAKEFIELD, are the chief Centres of the Manufactures of Woollen Cloths and Stuffs. Leeds is the principal Mart for broad Cloths. The Cloth-hall appropriated to the Sale in a vast Edifice, and the whole Business is transacted within the Space of an Hour on the Market Days.

HULL is celebrated for its large Dock, and its Trade with America and the South of Europe is very important. The coasting Traffic is extensive in Coals, Corn, Wool, and various Manufactures.

NEWCASTLE, so named from a Fortress, erected by Edward I. is a large and very populous Town, in the Centre of the grand Coal-mines in the Counties of Durham and Northumberland which have for many Centuries supplied London, and most of the East and South of England with that Species of Fuel.

In the West of England, EXETER the Capital of Devonshire is an ancient and respectable City, the principal Commerce of which is in coarse woollen Goods, manufactured in Somersetshire, Devonshire and Cornwall. They are exported to Italy and other Parts of the Continent to the annual Value of 600,000*l.* and the East India Company purchase yearly to a very large Amount. Some Ships from Exeter are engaged in the Cod and Whale Fishery.

SALISBURY is famous for its Flannels and Cutlery, particularly for the Manufacture of Scissars. Wilton is celebrated for its Carpets.

WINCHESTER, the chief City of Hampshire, was for many Centuries the Metropolis of England: it still retains many vestiges of ancient Fame and Splendour. Besides a Cathedral, Winchester has a College founded by William of Wickham, which has sent forth many illustrious Characters.

PORTSMOUTH, in the same County, is the grand Naval Arsenal of England. The Harbour is noble and capacious, narrow at the Entrance, but spreading out into an inland Bay, five or six Miles in Length, and from two to four in Breadth.

CANTERBURY, the chief Town in Kent, and the Metropolis of the English Church, is chiefly remarkable for Ecclesiastical Antiquities.

NORWICH, the Capital of Norfolk, from its Size and Consequence, is justly styled a City. It is a Place of great Trade, particularly in Camblets, Crapes, Stuffs, and other woollen Manufactures. The Wool is chiefly from the Counties of Lincoln, Leicester, and Northampton, and the principal Exports are to Holland, Germany, and the Mediterranean.

CAMBRIDGE is remarkable for a University containing 12 Colleges and 4 Halls, all well endowed, and are as folows, viz.

When founded.	COLLEGES.	By whom Founded.
1284	*Peter House,*	Hugh de Bathan, Bp. of Ely.
1346	*Corpus Christi,* or *Bennet*	Henry of Monmouth, Duke of Lancaster.
1348	*Gonvil* and *Caius,*	So called from its several Founders.
1441	*King's* - - - - -	Henry VI.
1448	*Queen's* - - - - -	Margaret his Queen.
1497	*Jesus* - - - - -	John Alcocke, L.L.D. Bishop of Ely.
1506	*Christ's* - - - - -	Margaret, Countess of Richmond.
1506	*St. John's* - - - -	Ditto.
542	*Magdalen* - - - -	Edward Strafford, Duke of Buckingham..
546	*Trinity* - - - - -	King Henry VIII.
584	*Emanuel* - - - -	Sir Walter Mildmay.
598	*Sidney Sussex* - - -	Frances Sidney, Countess of Sussex.

	HALLS.	
343	*Clare* - - - - -	Richard Badew.
347	*Pembroke* - - - -	Mary, Countess of Pembroke.
353	*Trinity* - - - - -	W. Bateman, Bp. of Norwich
519	*Catherine* - - - -	Robert Wood, the Chancellor

OXFORD is famous for having the finest University in the World, which consists of 20 Colleges endowed, and five Halls not endowed, viz.

When founded.	COLLEGES.	By whom Founded.
872	*University* - - -	The Saxon King Alfred.
262	*Baliol,* - - - -	John Baliol, King of Scotland.
274	*Merton* - - - -	Walter de Merton, Bishop of Rochester.
316	*Exeter* - - - -	Walter Stapleton, Bp. of Exeter.
325	*Oriel* - - - - -	King Edward II.
340	*Queen's* - - - -	Robert Eglesford, B. D.
375	*New* - - - - -	William of Wickham, Bishop of Winchester.
427	*Lincoln* - - - -	Richard Fleming, and Thomas Rotheram, Bishop of Lincoln.

When founded.	COLLEGES.	By whom founded.
1437	*All Souls* - - - -	Henry Chichley, Abp. of Cant.
1459	*Magdalen* - - -	William of Wainfleet, Bishop of Winchester.
1511	*Brazen Nose* - -	William Smith, Bp. of Lincoln, and Sir Richard Sutton, Knt,
1516	*Corpus Christi* - -	Rich. Fox, Bp. of Winchester.
1549	*Christ Church* - -	King Henry VIII.
1555	*Trinity* - - - -	Sir Thomas Pope.
1557	*St. John's* - - -	Sir Thomas White, Lord Mayor of London.
1571	*Jesus* - - - - -	Queen Elizabeth.
1609	*Wadham* - - -	Nicholas Wadham, Esq.
1620	*Pembroke* - - -	Thomas Tesdale, Esq. and Richard Whitwick, B. D.
1700	*Worcester* - - -	Sir Thomas Cooke.
1740	*Hartford* - - -	Dr. Newton.

HALLS.

St. Edmund's	belonging to	Queen's	College.
St. Alban's		Merton	
St. Mary's		Oriel	
New Inn		New	
Magdalen		Magdalen	

THE PRINCIPALITY OF WALES.

WALES was originally independent of *England*, but in the Reign of King Henry the VIIth, it was incorporated with it. This Country is very mountainous and barren, except in the Vallies and Intervals, where it yields Plenty of Grass and Corn. The Situation is westward, bordering on the Irish Sea; the Air bleak and sharp, but wholesome; the Cattle are numerous, but very small; and on the Hills there are Goats in Abundance. This County is divided into North and South.

WALES is divided into twelve Counties, as follow.

Counties.	*Chief Towns.*	*Counties.*	*Chief Towns.*
Flintshire	Flint	Radnorshire	Radnor
Denbighshire	Denbigh	Brecknockshire	Brecknock
Montgomerysh.	Montgomery	Glamorganshire	Cardiff
Anglesea	Beaumaris	Pembrokeshire	Pembroke
Caernarvonsh.	Caernarvon	Cardiganshire	Cardigan
Merionethshire	Harlech	Carmarthenshire	Carmarthen

North Wales contains Anglesey, Carnarvonshire, Denbighshire, Flintshire, Merionethshire, and Montgomeryshire.

Anglesey is an Island in the North-west Part of the Country, about 80 Miles in Compass. The common Passage to Ireland is from Holyhead in this Island to Dublin.

South Wales contains Brecknockshire, Cardiganshire, Carmarthenshire, Glamorganshire, Pembrokeshire, and Radnorshire.

Pembrokeshire is a very pleasant and plentiful County, for the most Part surrounded by the Sea. It is famous for a Harbour called *Milford Haven*, which is justly esteemed to be in all Respects one of the best in the World.

SCOTLAND.

SCOTLAND is the northern Division of *Great Britain*, and is situated to the North of *England;* the capital City is called Edinburgh; it is divided into the following thirty-three Counties, as follows.

Shires.	*Chief Towns.*	*Shires.*	*Chief Towns.*
Edinburgh	Edinburgh	Bute & Caithness	Rothsay
Haddington	Dunbar	Renfrew	Renfrew
Merse	Dunse	Stirling	Stirling
Roxburgh	Jedburgh	Linlithgow	Linlithgow
Selkirk	Selkirk	Argyle	Inverary
Peebles	Peebles	Perth	Perth
Lanerk	Glasgow	Kincardin	Bervie
Dumfries	Dumfries	Aberdeen	Aberdeen
Wigtown	Wigtown	Inverness	Inverness
Kircudbright	Kircudbright	Nairne and	Nairne and
Air	Air	Cromartie	Cromartie
Dumbarton	Dumbarton	Fife	St. Andrew's
Forfar	Montrose	Kinross	Kinross
Bamff	Bamff	Ross	Taine
Sutherland	Strathy Darnoe	Elgin	Elgin
Clacmannan	Clacmannan	Orkney	Kirkwall.

Berwick upon Tweed lies between England and Scotland, and is distinguished from both, by having its own peculiar Privileges, and a small Territory within its Jurisdiction.

The most considerable Towns in Scotland next to Edinburgh are Glasgow, and Aberdeen, all of which are famous for their Universities: Glasgow is no less so for its extensive Commerce.

The Islands belonging to Scotland, are the Shetland, the Orkney, and the Hebrides, or Western Islands.

The Hebrides, or Western Isles, are said to be above 300 in Number, the most considerable of which are Arran, Sky, and Mull; and the Isles of Orkney, and Shetland, to the northward of each of which, there are many in Number.

The principal Rivers are the Forth, the Tay, the Dee, and the Don; and the most considerable Lakes are Loch Tay; Loch Lomond, which contains several Islands; and Loch Ness, in Invernesshire.

IRELAND

IS a large Island to the West of *England* and *Scotland*, the chief City of which is *Dublin*; it is divided into four Provinces, viz. *Ulster*, northward; *Leinster*, eastward; *Munster*, southward; and *Connaught*, westward. These are again subdivided into the following Counties.

	Counties.	*Chief Towns.*		*Counties.*	*Chief Towns.*
Leinster.	Dublin	Dublin	Ulster.	Antrim	Carrickfergus
	Louth	Drogheda		Londonderry	Derry
	Wicklow	Wicklow		Tyrone	Omagh
	Wexford	Wexford		Fermanagh	Inniskilling
	Longford	Longford		Donegal	Lifford
	East Meath	Trim	Connaught.	Leitrim	Roscommon
	West Meath	Mullinger		Roscommon	Ballingrobe
	King's County	Phillipstown		Mayo	Carrick on Shan.
	Queen's County	Maryborough		Sligo	Sligo
	Kilkenny	Kilkenny		Galway	Galway
	Kildare	Naas & Atby	Munster.	Clare	Ennis
	Carlow	Carlow		Cork	Cork
Ulster.	Down	Downpatrick		Kerry	Trale
	Armagh	Armagh		Limerick	Limerick
	Monaghan	Monaghan		Tipperary	Clonmel
	Cavan	Cavan		Waterford	Waterford

The chief Towns next to Dublin, the Capital, are Cork, Londonderry, and Belfast. Cork is a flourishing, commercial City, and remarkable for its fine Harbour. The principal Rivers are the Shannon, the Blackwater, the Boyne, and the Liffy.

In St. George's Channel, almost equally distant from England, Scotland, and Ireland, is situated the Isle of Man, the Royalty of which, under the Kings of Great Britain, was formerly in the Family of the Stanleys, Earls of Derby; but the Male Issue of that Family being extinct, it was enjoyed by the Duke of Athol, descended from the Derby Family by a Female Branch, till the Session of Parliament 1765, when it was annexed to the Crown.

The Britannic Isles above described are separated from France, on the South by the English Channel; and from Holland, Germany, Denmark and Norway, by the German Ocean on the East; the Northern and Western Sides being washed by Oceans of the same Name.

HOLLAND, or, as it is now called, the *Batavian Republic*, has Germany on the East and North, the German Ocean, to the West, and France to the South. It consists of the Seven following Provinces.

Provinces.	*Chief Towns.*
Groningen,	Groningen,
Friesland.	Lewarden,
Over-yssel,	Deventer,
Holland,	Amsterdam,
Utrecht,	Utrecht,
Guelderland,	Zatphen,
Zealand,	Middleburgh.

The chief Towns with regard to commercial and other mportant Purposes, are Amsterdam, Leyden, Rotterdam, and Haarlem.

The Hague is the largest, and was the richest Village n the World; it is thirty Miles from Amsterdam; and was, before the Revolution, the Seat of Government, and he Residence of the principal People.

Amsterdam, the Capital, is curiously built upon wooden Piles. Leyden is famous for its University. The Streets have Canals running through them, the Borders of which are planted with Rows of Trees. The principal Rivers are he Rhine, the Maese, and the Scheldt. The Canals are very numerous, and serve for the same Purpose as Roads in ther Countries.

ASIA.

ASIA is separated from Europe towards the North-west; owards the South-west by the eastern Part of the Mediterranean Sea; and by the Isthmus of Suez and the Red Sea, which divide it from Africa; it is bounded on the South by the Indian Ocean; on the East by the Pacific; and on the North by the Northern or Frozen Ocean; its Dimensions may be conceived from what follows.

It seems most regular to divide this large Country according to its present Possessors, the Grand Signior or Emperor of the Turks, the King of Persia, the Great Mogul, and the other Potentates of India, the Emperor of China, and the Potentates of Tartary.

The Turk's Possessions in Asia are Anatolia, Syria, Arabia, Armenia, or Turcomania, Georgia, and Mesopotamia or Diarbeck; of which in their Order.

Anatolia, formerly called Asia-Minor, is encompassed on the North, West, and South Sides, by the Euxine, the Marmorian, the Archipelago, and the Mediterranean Seas; it is separated from Syria on the South-east by the Mountains called Taurus, and from Murcomania on the East by the River Euphrates.

Syria, called by the Turks, Suristan, is generally subdivided into Syria Proper, Phœnicia, and Palestine or Judea; whose chief Cities are Aleppo, Damascus and Jerusalem.

Arabia (a Country which preserves its ancient Name, as do the Inhabitants their roaming Disposition) is bounded on the West by the Red Sea and Isthmus of Suez; on the North by Palestine, Syria, and Diarbeck; on the East by the Persian Gulf, and on the South-west by the Arabian Sea, a Part of the Indian Ocean.

It is divided into three Parts, called the Desert, the Stony, and the Happy; the two first lie to the Northward, the other to the South.

There are very few Towns in the Desart or Stony Parts of this Country; the Arabs living in Tents, and removing with their Families from Place to Place, as Profit or Convenience suggest. But in Arabia the Happy (one of the finest Countries in the World) there are several of Note, such as Medina, where the Sepulchre of Mahomet, the Founder of the Turkish Religion, is; Mecca, his Birth-place, to which every Turk or Mussulman is obliged by that Religion to come in Pilgrimage once in his Life-time, or to send another in his Stead; *Aden*, a Place of Traffic; and Mocha, famous for its Coffee.

Armenia or Turcomania is bounded on the West by Anatolia,

tolia, on the South by Diarbeck, on the East and North by Georgia and the Euxine Sea.

Georgia, formerly called Iberia, including Mingrelia and Gurgestan, is bounded on the North by Part of Russia, on the West by the Euxine Sea, on the South by Turcomania, and Part of Persia, and on the East by Part of Persia; the Cities of the greatest Note are Fasso and Teflis.

Mesopotamia or Diarbeck, is bounded on the North by Turcomania, on the West by Syria, on the South by Arabia the Desart, and on the East by Persia; its principal Cities are Diarbeker, and Bagdat.

Besides these large Possessions on the Continent of Asia, the Turks hold several Islands in the Archipelago; with Rhodes and Cyprus in the Mediterranean Sea, the last of which is very considerable.

The next Division of Asia, proceeding Eastwardly, is Persia, which has the Turkish Dominions on the West, the Persian Gulph and Part of the Indian Ocean on the South, the Empire of the Great Mogul on the East, and, on the North, Part of Tartary, the Caspian Sea, and Part of the Russian Empire.

This is a very large Country, but at present it is torn to Pieces by different Competitors for the sovereign Power; the capital City is Ispahan; the most considerable of the others are Derbent on the Caspian Sea, and Gombroon and Bassora on the Persian Gulph.

Proceeding still Eastward, the next Empire is that of the Great Mogul, which has Persia on the West, the two Indian Peninsulas and the Bay of Bengal on the South, China on the East, and Part of Tartary on the North.

This is another large Tract, with the inland Parts of which the Europeans are not much acquainted.

The principal Cities are Agra, Lahor, Delhi, Cabul, and Casimir; but whether Agra or Lahor is the Capital, is difficult to determine, the Mogul hath a magnificent Palace at each of these Cities.

The maritime Parts of the Continent of India are divided by the Bay of Bengal, a Branch of the Indian Ocean, into two Peninsulas, anciently called India, within, or on this Side the Ganges and India, and without or beyond the Ganges; besides which two Peninsulas, there are several large Islands belonging to India, of which in their Order.

The Peninsula on this Side the Ganges, contains several distinct Territories or Kingdoms, most of which either are or were subject, or at least tributary, to the Mogul; the Western Side thereof is called the Coast of Malabar, the Eastern the Coast of Coromandel.

The Coast of Malabar contains several European Settlements; such as Bombay, an Island belonging to the English East-India Company, and Goa, to the Portuguese, at each of which they have the Sovereignty; and the English trade at least, if they have not Forts, at Guzurat, Surat, Calicut, and Cochin.

The Island of Ceylon, by some called Zeloan, is situated a little to the East of Cape Comorin, the most Southern Point of this Peninsula.

The Coast of Coromandel, which is washed by the Bay of Bengal, tends towards the North and North East from Cape Comorin, and extends to the Mouth of the Ganges; the principal Settlements of the English on this Coast are, Madras or Fort St. George, and Fort St. David, near which the French had a Settlement called Pondicherry; which neighbouring Settlements were for several Years at War with each other, with various Success, the Natives, headed by their Princes, called Nabobs, having taken Part therein, some on one Side, and some on the other; but the English were at last victorious, and have lately had large Provinces yielded to them by the Princes of the Country.

The Peninsula on the other Side of the Ganges, consists of the large Kingdoms of Bengal, having a Capital of the same Name; Pegu, whose chief Cities are Pegu and Arracan; Siam, having a Capital of the same Name; Malacca situate to the South, is almost encompassed by the Sea, and the City, so called, is situate near the Southern Extremity; Cochin-China, whose chief City is Cambodia, and Tonquin, whose Capital is of the same Name.

South-West of Malacca is the Island of Sumatra.

South-East of this lies the Island of Java, separated by the Straits of Sunda; the Western Point of which is called Java Head by English Mariners, it being often the first Land made by them after they have doubled the Cape of Good Hope; the principal Cities are Bantam and Batavia, the latter of which belongs to the Dutch East India Company, who are Sovereigns over the greatest Part of this large and fruitful Island.

Eastward from Malacca and Sumatra is the Island Borneo, almost round, and near 600 Miles in Diameter.

The Island Celebes is to the East of Borneo, but much less than it. Proceeding Eastward are the Molucca, or Spice Islands; the Dutch have made themselves Masters of these, and thereby engross the Spice Trade to themselves.

The Philippine Isles are very numerous, some Authors have reckoned 10,000 of them; the most considerable is Luconia, whose Capital is Manilla.

To the North and North-West of these is situated the potent Empire of China, reckoned by some to be as big as all Europe; it hath the Pacific Ocean on the East and South-East: Cochin-China and Tonquin on the South-West; the Mogul's Empire on the West, and on the North-West and North a Part of Tartary.

There are a great Number of Cities in this Empire, of which Pekin, situated in the Northern Part of the Country is the Capital; the European Trade to this Country is chiefly carried on at Canton, a great Seaport in one of the Southern Provinces.

The most considerable Chinese Islands are those which compose the Empire of Japan; which consists of several large Islands, the largest of these is Niphon: and the chief Towns are Jeddo, Miaco and Nagasaki.

Thus we have taken a cursory Survey of all the Southern Parts of Asia; the Northern hath only one general Name, *viz.* Tartary, which has Persia, India, and China, on the South, the Pacific Ocean on the East, the Northern or Frozen Ocean on the North, and Russia on the West; this large Tract is subject to divers Potentates, some of whom are very little known.

AFRICA.

AFRICA is a large Peninsula which is joined to the Continent of Asia, by the Isthmus of Suez, a narrow Desart between the Mediterranean and Red Seas. The inland Parts of this Continent are not much known to the Europeans; so that only the Sea-coasts will be mentioned here, beginning at the Isthmus of Suez, and coasting first along the Mediterranean Sea.

Egypt is under the Dominion of the Turks; its present Capital is called Cairo; the piratical States of Tripoly, Tunis, and Algiers, have Capitals of the same Name, and the Capital of the Empire of Morocco is the City of Fez.

Along the Coasts of the Atlantic Ocean, there are no extensive Dominions, the Inhabitants being mostly subject to petty Princes of their own, who being almost continually at War with one another, sell their Prisoners for Slaves: The European Nations have been induced, for the Protection of their Trade therein, and other Commodities, to erect several small Forts in different Places, to enumerate which would be tedious: The Madeiras, the Canaries, and the Cape Verd Islands, are the most considerable on this Coast; the only one possessed by the English, is a very small one, called St. Helena, frequented by the East India Ships.

At the southern Extremity of the Continent is situated the Cape of Good Hope, where there is a tolerable Town for the Convenience of Shipping, built by the Dutch East India Company; from hence, along the Eastern Coast, both on the Ocean and in the Red Sea, very little remarkable offers itself to notice.

At some Distance, however, from that Part of this Coast is situated one of the largest Islands in the World, called Madagascar, which has been at different Times the Asylum of European Pirates.

AMERICA.

AMERICA, by some called the New World, because discovered about 308 Years ago, being, before that Time unknown to the Inhabitants of Europe, Asia, and Africa, is divided into two remarkable Divisions, called North and South America, which are joined together by the Isthmus of Darien or Panama.

North America includes the United States, Spanish America, British America, and the Independent Indian Nations.

The inland Seas of North America are the Gulphs of Mexico, California, and St. Lawrence, with Hudson's Bay, and Davis's Straits. The Gulph of St. Lawrence is closed by the Island of Newfoundland, and the great Sand Bank, about four Hundred Miles in Length, celebrated for the Cod Fishery.

The Lakes Superior, Michigan, Huron, Wennipeg, and Slave Lake, are the grandest in the World, and might, with propriety, be denominated Seas. The Rivers are also grand Features of North America. Of these, the principal are the Missouri, or Mississippi, the Ohio, and the St. Lawrence:

rence: and the most celebrated Mountains are the Apalachian, passing through the Territory of the United States. Among these the Ohio has its Rise.

The UNITED STATES are divided into Northern, Middle, and Southern.

The Northern States are Vermont, New Hampshire, Massachusetts, Connecticut, and Rhode Island. The Middle States are New York, New Jersey, Pennsylvania, Delaware, and the Territory on the North-west of the Ohio. The Southern States are Maryland, Virginia, Kentucky, North Carolina, Georgia, and the Country South of Kentucky. The chief Cities and Towns are Washington, the Capital, Philadelphia, New York, Boston, Baltimore, and Charlestown.

The Spanish Dominions are Louisiana, (which has been lately ceded to the United States for a certain Sum of Money) East and West Florida, New Mexico, and Old Mexico, or New Spain. Mexico is the Capital of all Spanish America. The chief River in Spanish America is Rio Bravo, and the principal Lake is Nicaragua.

The British Dominions are amazingly extensive, and include Upper and Lower Canada, Nova Scotia, New Brunswick, the Island of Breton, Newfoundland, the Bermudas, or Somer Islands.

The Native Tribes and Independent Countries. These are Greenland, Labrador, the Regions around Hudson's Bay, those Nations lately discovered by Sir A. Mackenzie, and those on the Western Coast.

Of the West Indies. The most important of these Islands are Cuba, and Porto-Rico, Spanish; St. Domingo, French; and Jamaica, English. North of St. Domingo and Cuba, are the Bahamas, the principal of which is Providence Island. The Caribbee Islands extend from Tobago in the South to the Virgin Islands in the North. Those belonging to Britain are Barbadoes, Antigua, St. Christopher's, St. Vincent, Dominica, Grenada, Trinidad, Montserrat, Nevis, and the Virgin Isles. The French Caribbee Islands are Martinique, Guadaloupe, St. Lucie, and Tobago. The Danes possess St. Croix and St. Thomas. St. Bartholomew belongs to the Swedes, and Eustatia to the Dutch.

From these Islands are procured Sugar, Rum, Cotton, Indigo, Spices, Cocoa, and Coffee: in Time of War the smaller and inferior Islands are continually changing their Masters.

South America comprehends Terra Firma, Guiana, Amazonia, Peru, Brazil, Paraguay, Chili, and Patagonia.

Amazonia and Patagonia are not under the Yoke of any European Power; they are divided into several Kingdoms, each of which has its Chief. The Inhabitants worship the Images of their departed Heroes, but have no Temples nor Priests.

South America has no inland Sea, but the River Amazons and that of La Plata are celebrated as the largest in the World. They both have their Rise among the Andes. The Mountains of South America are the loftiest on the whole Face of the Globe, and are intermixed with Volcanos of the most sublime and terrific Description. The Andes follow the Windings of the Coast, and extend four Thousand six Hundred Miles. The highest are near the Equator, and are covered with perpetual Snow. The Spanish Dominions in South America are Buenos-Ayres, Peru, Chili, and New Grenada. Peru and Chili are famous for their Gold and Silver Mines. In Chili it never Rains, the Sky is seldom Cloudy, but the Dews of Night supply the Want of Rain.

The Portuguese Territory of Brazil is perhaps equal in Extent to the Spanish, compensating by its Breadth for its Deficiency in Length. Guiana belongs partly to the French, and partly to the Dutch. Cayenne consists of a considerable Territory on the Continent, and of an Island of the same Name.

The Southern Extremity of South America is Patagonia, a desolate Country inhabited by savage Indians, some of whom are of Colossal Stature. The Islands contiguous to South America are Trinidad, the Falkland Islands, Terra del Fuego, Chiloe, and Juan Fernandez. The Gallipago Islands are near the Equator, and the Pearl Islands lie in the Bay of Panama.

ASTRONOMY.

ASTRONOMY is a Science which treats of the Motions and Distances of the heavenly Bodies, and of the Appearances arising from them.

There have been a great Variety of Opinions, among Philosophers, concerning the Disposition of the great Bodies of the Universe, or of the Position of the Bodies which appear in the Heavens: But the Notion now embraced by the most judicious Astronomers is, that the Universe is composed of an infinite Number of Systems or Worlds; that in every System there are certain Bodies moving in free Space, and revolving at different Distances around a Sun, placed in or near the Centre of the System; and that these Suns, or the other Bodies, are the Stars which are seen in the Heavens.

That System, to which our Earth belongs, is by Astronomers called the *Solar System*; and the Opinion, which supposes the Sun to be fixed, in or near the Centre, with several Bodies revolving round him, at different Distances, is confirmed by all the Observations hitherto made.

This Opinion is called the *Copernican System*; from Nicholas Copernicus, a Polish Philosopher, who, about the Year 1473, revived this Notion from the Oblivion it had been buried in for many Ages.

The Sun therefore placed in the Midst of an immense Space, wherein ten opaque spherical Bodies revolve about him as their Centre. Seven of these wandering Globes are called the Planets, who, at different Distances, and in different Periods, perform their Revolutions, from West to East, in the following Order.

I. ☿ *Mercury* * is nearest to the Sun of all the Planets, and performs its Course in about three Months, or 87 d. 23h. II. ♀ *Venus*, in about seven Months and a Half, or 224d. 17 h. III. ⊕ The *Earth*, in a Year, 365 d. 6 h. IV. ♂ *Mars*, in about two Years, or 686 d. 23 h. V. ♃ *Jupiter*, in twelve Years, or 4232d. 12h. VI. ♄ *Saturn* spends almost Thirty Years, that is 10759d. 8h. in one Revolution round the Sun. And the ♅ *Herschell* Planet, whose Year is equal to almost eighty-two of ours. The Distances of the Planets from the Sun are nearly in the following Proportion, *viz.* supposing the Distance of the Earth from the Sun to be divided into 100 equal Parts; that of *Mercury* will be about 37 of those Parts; of *Venus* 66; of *Mars* 155; of *Jupiter* 493; of *Saturn* 903; and that of the *Herschell* 1813.

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* *The Characters, placed before the Names of the Planets, are for Brevity's Sake commonly made Use of by Astronomers, instead of the Words at Length,* ♀ *as for* Venus, &c.

The Orbits * of the Planets are not all in the same Plane, but variously inclined to one another: so that, supposing the Orbit of the Earth to be the Standard, the others will have one Half above, and the other Half below it; intersecting one another in a Line passing through the Sun.

Besides these seven large Planets, three smaller Bodies have been discovered revolving about the Sun between the Orbits of *Mars* and *Jupiter*.

The Plane of the Earth's Orbit is called the Ecliptic; and this the Astronomers make the Standard, to which the Planes of the other Orbits are judged to incline.

The right Line passing through the Sun, and the common Intersection of the Plane of the Orbit of any Planet with the Ecliptic, is called the Line of the Nodes of that Planet, and the Points themselves, wherein the Orbits cut the Ecliptic, are called the Nodes. The Orbits of the Planets are not Circles, but Ellipses or Ovals.

What an Ellipsis is, may be easily understood from the following Description: imagine two small Pegs or Pins fixed upright on any Plane as a Table, and suppose them tied with the Ends of a Thread, somewhat longer than their Distance from one another; now if a Pin be placed in the Double of the Thread, and turned quite round (always stretching the Thread with the same Force) the Curve described by the Motion will be an Ellipsis. The two Points where the Pegs stood, (about which the Thread was turned) are called the Foci of that Ellipsis; and, if without changing the Length of the Thread, we alter the Position of the Pegs, we shall then have an Ellipsis of a different Kind from the former; and the nearer the Foci are together, the nearer will the Curve described be to the Circle, until at last the two Foci coincide, and then the Pin in the Doubling of the Thread will describe a perfect Circle.

The Orbits of all the Planets have the Sun in one of their Foci, and half the Distance between the two Foci is called the Excentricity of the Orbits.. This Excentricity is different in all the Planets, but in most of them it is so small, that in little Schemes or Instruments, made to represent the planetary Orbits, it need not be considered.

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* *By the Orbit of a Planet, is commonly understood, the Track or Ring, described by its Circuit round the Sun; but by the Plane of the Orbit, is meant a flat Surface, extended every Way through the Orbit infinitely.*

The ten Planets above-mentioned, are called Primaries, or rimary Planets; but, besides these, there are eighteen other esser Planets, which are called Secondaries, Moons, or Satellites. These Moons always accompany their respective Primaries, and perform their Revolutions round them, whilst oth together are also carried round the Sun.

Of the Primary Planets, there are but four, as far as Observation can assure us, that have these Attendants, *viz.* the *Earth, Jupiter, Saturn,* and the *Herschel.*

The *Earth* is attended by the *Moon,* who performs her Revolution in about 29½ Days, at the Distance of about 30 Diameters of the *Earth* from it; and once a Year is carried ound the Sun along with the *Earth.*

Jupiter has four Moons or Satellites: the first or innermost performs its Revolution in about one Day and 18½ Hours, at the Distance of 5½ Semidiameters of *Jupiter* rom his Centre; the second revolves about *Jupiter* in Days and 18 Hours, at the Distance of 9 of his Semi-Diameters; the third in 7 Days and 3 Hours, at the Distance of 14⅓ Semi-diameters; the fourth and outermost performs its Course in the Space of 16 Days 18 Hours, and ts Distance from *Jupiter's* Centre is 25⅓ of his Semi-diameters.

Saturn has no less than seven Satellites; the first or innermost revolves about him in 1 Day and 21 Hours, at the Distance of 4⅗ Diameters of *Saturn* from his Centre; the econd completes his Period in 2¾ Days, at the Distance f 5⅗ Diameters; the third, in about 4½ Days at the Distance of 8 Diameters; the fourth performs his Course in bout 16 Days, at the Distance of 8 Diameters; the fifth akes 79⅓ Days to finish his Course, and is 54 Diameters of *aturn* distant from his Centre. The sixth performs its Revolution in 1⅓ Day; and the seventh in little more than 22 Hours, these two are nearest to the Planet, but being iscovered last are called the sixth and seventh instead of e first and second. The Satellites, as well as the Primaries, perform their Revolutions from West to East; e Planes of the Orbits of the Satellites of the same Planet re variously inclined to one another, and consequently are nclined to the Plane of the Orbit or their Primary.

Besides these Attendants, *Saturn* is encompassed with a thin Ring that does no where touch his Body; the Diameter of this Ring is to the Diameter of *Saturn*, as 9 to 4; and the void Space, between the Ring and the Body of *Saturn* is equal to the Breadth of the Ring itself; so that in some Situations the Heavens may be seen between the Ring and his Body.

This surprising Phenomenon of *Saturn's* Ring is a Modern Discovery; neither were the Satellites of *Jupiter* and *Saturn* known to the Ancients; the former were first discovered by the famous Italian Philosopher Galileo, by a Telescope, which he first invented; and the celebrated Cassini, the French King's Astronomer, was the first that saw the five Satellites of Saturn; which, by Reason of their grea Distances from the Sun, and the Smallness of their own Bodies, cannot be seen by us, but by the Help of very goo Glasses.

The six Satellites of the *Herschel* revolve about the Plane in the following Times: The first in 5 d. 21 h. the secon in 19 d. 17 h. the third in 11 Days; the fourth in 13 d 11 h. the fifth in 38 Days; and the sixth in 107 d. 16 h.

The Motion of the primary Planets round the Sun, (a also of the Satellites round their respective Primaries) i called their annual Motion; because they have a Year, o the Alterations of the Seasons, to complete in one of thos Revolutions. Besides their annual Motion, four of th Planets, *viz.* *Venus*, the *Earth*, *Mars*, *Jupiter* and *Saturn*, ar known to revolve about their own Axis, from West t East; and this is called their diurnal Motion. For, by th Rotation each Point of their Surface is carried successivel towards, and from the Sun, who always illuminates the Hem sphere which is next to him, the other remaining obscure And, while any Place is in the Hemisphere illuminated b the Sun, it is Day; but when it is carried to the obscu Hemisphere, it becomes Night; and so continues until, i this Rotation, the said Place is again enlightened by the Su

The *Earth* performs its revolution round its Axis in Hours 56 Minutes; *Venus* in 28 Hours; *Mars* in about Hours and 40 Minutes; and *Jupiter* moves around his ow Axis in 9 Hours and 56 Minutes.

The Sun is also found to turn round his Axis from We to East in 25 Days; and the Moon which is nearest to us all the Planets, revolves about her Axis in a Mont or in the Space of Time that she turns round the Earth; th hat the Lunarians have but one Day throughout *their* Year.

The Planets are all opaque Bodies, having no Light but vhat they borrow fiom the Sun; for that Side of them, vhich is next towards the Sun, has always been observed o be illuminated, in whatever Position they be; but the pposite Side, which the Solar Rays do not reach, remains lark and obscure; whence it is evident that they have no Light but what proceeds from the Sun, for if they had, all 'arts of them would be lucid, without any Darkness or hadow. The Planets are likewise proved to be globular, ecause, let what Part soever of them be turned towards the un, its Boundary, or the Line separating that Part from he opposite, always appears to be circular; which could ot happen if they were not globular.

The *Earth* is placed betwixt the Orbs of *Mars* and *Ve-us*. *Mercury*, *Venus*, *Mars*, *Jupiter*, *Saturn*, and the *lerschel*, all move round the Sun; both which may be roved from Observations, as follows:

1. Whenever *Venus* is in Conjunction with the Sun, that , when she is in the same Direction from the *Earth*, or owards the same Part of the Heavens the Sun is in, she ither appears with a bright and round Face, like a full Ioon, or else disappears; or, if she is visible, she appears orned like a new Moon; which Phœnomena could never appen, if *Venus* did not turn round the Sun, and was not etwixt him and the *Earth*: for since all the Planets borrow eir Light from the Sun, it is necessary that *Venus's* lucid ace should be towards the Sun; and when she appears lly illuminated, she shews the same Face to the Sun and e Earth; whence, at that Time, she must be beyond the in, for in no other Position could her illuminated Face be holly seen from the Earth. Farther, when she disappears; , if visible, appears horned; that Face of hers, which is wards the Sun, is either wholly turned from the Earth, only a small Part of it can be seen by the Earth; and in is Case she must of Necessity be betwixt us and the Sun. hese Observations must be made with a Telescope.

Besides the foregoing, there is another Argument to prove, at *Venus* moves round the *Sun* in an Orbit that is within the irth's; because she is always observed to keep near the *in*, and in the same Quarter of the Heavens that he is in, ever receding from him more than about $\frac{1}{8}$ of a whole

Circle; and therefore she can never come in Opposition to him, that is, the Earth never can be between the Sun and Venus, which would necessarily happen, did she perform her Course round the Earth either in a longer or shorter Time than a Year.

And this is the Reason why *Venus* is never to be seen near Midnight, but always either in the Morning or Evening, and at most not above three or four Hours before Sun-rising, and after Sun-setting from the Time of *Venus*'s superior Conjunction, or when she is beyond the *Sun*, she is more easterly than the Sun, and therefore sets later, and is seen after Sun-setting; and then she is commonly called the *Evening-Star*: but from the Time of her inferior Conjunction, till she comes again to the superior, she then appears more westerly than the Sun, and is only to be seen in the Morning before Sun rising; and is then called the *Morning Star*.

After the same Manner, we prove that *Mercury* turn round the Sun, for he always keeps in the Sun's Neighbourhood, and never recedes from him so far as *Venus* does: and therefore the Orbit of Mercury must lie within that o *Venus*, and on Account of his nearness to the Sun, he car seldom be seen without a Telescope.

Mars is observed to come in Opposition, that is, th Earth is sometimes between the Sun and Mars, he alway preserves a round, full, and bright Face, except when he i near his Quarters, when he appears somewhat gibbous, lik the Moon, three or four Days before or after the Full Therefore the Orbit of *Mars* must include the Earth withi it, and also the Sun; for if he were betwixt the Sun and u at the Time of his inferior Conjunction, he would eithe quite disappear, or appear horned, as *Venus* and the Moo do in that Position.

Mars, when he is in Opposition to the Sun, appears to t almost seven Times larger in Diameter, than when he is i Conjunction with him; and, therefore, must needs be a most seven Times nearer to us, in one Position, than in th other: For the apparent Magnitudes of distant Objec increase, or decrease, in Proportion to their Distances fro us; but *Mars* keeps always, nearly, at the same Distan from the Sun, therefore, it is plain, that it is not the Ear but the Sun that is the Centre of his Motion.

It is proved, in the same Way, that *Jupiter*, *Saturn*, a

t

Herschel, have both the Sun and Earth within their Orbits; and that the Sun, and not the Earth, is the Centre of their Motions; although the Disproportion of the Distances from the Earth, is not so great in *Jupiter* as in *Mars*, nor so great in *Saturn* as it is in *Jupiter*, because they are at a much greater Distance from the Sun.

We have now shewn that all the Planets turn round the *Sun*, and that *Mercury* and *Venus* are included between him and the Earth, whence they are called the inferior Planets, and that the Earth is placed between the Orbits of *Mars* and *Venus*, and therefore included within the Orbits of *Mars*, *Jupiter*, *Saturn*, and the *Herschel* Planet, whence they are called the superior Planets: And since the Earth is in the Middle of these moveable Bodies, and is of the same Nature with them, we may conclude, that she has the same Sort of Motions:—but that she turns round the *Sun* is proved thus:

All the Planets seen from the Earth appear to move very unequally; as sometimes to go faster, at other Times slower, and sometimes to be stationary, or not to move at all; which could not happen if the Earth stood still *.

The annual Periods of the Planets round the Sun are determined, by carefully observing the Length of Time from their Departure from a certain Point to the Heavens (or from a fixed Star) until they arrived at the same again. By these Sorts of Observations, the Ancients determined the periodical Revolutions of the Planets round the Sun; and were so exact in their Computations, as to be capable of predicting Eclipses of the Sun ond Moon: But since the Invention of Telescopes, astronomical Observations are made with greater Accuracy, and consequently our Tables are far more perfect than those of the Ancients.

And, in order to be as exact as possible, Astronomers compare Observations made at a great Distance of Time from one another, including several Periods; by which Means the Error that might be in the Whole, is in each Period subdivided into such little Parts, as to be very inconsiderable. Thus the mean Length of a solar Year is known even to Seconds.

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* *This Subject, and whatever relates to the Science of Astronomy, is made very intelligible in the second Vol. of Scientific Dialogues.*

The diurnal Rotation of the Planets round their Axis was discovered by certain Spots, which appear on their Surfaces: These Spots appear first on the Margin of the Planets Disks, or the Edge of their Surfaces, and seem by Degrees to creep towards their Middle; and so on, going still forward, till they come to the opposite Side or Edge of the Disk, where they set or disappear; and after they have been hid for the same Space of Time that they were visible, they again appear to rise, in or near the same Place as they did at first; then to creep on progressively, taking the same Course as they did before. Spots of this Kind have been observed on the Surfaces of the *Sun*, *Venus*, *Mars*, *Jupiter*, and *Saturn*, by which Means it has been found, that these Bodies turn round their own Axis in the Times before mentioned.

It is very probable, that *Mercury* and the *Herschel* have likewise a Motion round their Axis, that all the Parts of their Surface may alternately enjoy the Light and Heat of the Sun, and receive such Changes as are proper and convenient for their Nature; but by Reason of the Nearness of *Mercury* to the *Sun*, and of the immense Distance of the *Herschel* from him, no Observation has hitherto been made, by which their Spots (if they have any) could be discovered, and therefore their diurnal Motions have not been determined. The diurnal Motion of the Earth is concluded to exist from the apparent Revolution of the Heavens, and of all the Stars round it, in the Space of a natural Day. For it is much easier to conceive, that this comparatively small Globe, should turn round its own Axis, once in 24 Hours, than that such a great Number of much larger Bodies, some of them so immensely distant, should revolve round it in so short a Space of Time. The solar Spots do not always remain the same, but sometimes old ones vanish, and afterwards others succeed in their Room; sometimes several small ones gather together and make one large Spot, and sometimes a large Spot is seen to be divided into many small ones. But notwithstanding these Changes, they all turn round with the Sun in the same Time.

Each Planet is observed always to pass through the Constellations *Aries*, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, *Pisces*, and it also appears that every one has a Track peculiar to itself; by which the Paths of the six Planets form, among the Stars, a Kind of Road, which is called the Zodiac; the middle

Part whereof, called the Ecliptic, is the Orbit described by the Earth, with which the Orbits of the other Planets are compared.

As the Ecliptic runs through twelve Constellations, it is supposed to be divided into twelve equal Parts, of 30 Degrees each, called Signs, having the same Names with the twelve Constellations they run through.

The Plane of the Ecliptic is supposed to divide the celestial Sphere in two equal Parts, called the Northern and Southern Hemispheres; and a Body situated in either of these Hemispheres, is said to have North or South Latitude, according to the Hemisphere it is in: thus the Latitude of a celestial Object is its Distance from the Ecliptic.

-The Planes of the other five Orbits are observed to lie partly in the Northern and partly in the Southern Hemisphere; so that every one cuts the Ecliptic in two opposite Points called Nodes; one, called the ascending Node, is that through which the Planet passes, when it moves out of the Southern into the Northern Hemisphere; and the other called the descending Node, is that through which the Planet must pass, in going out of the Northern into the Southern Hemisphere.

The right Line joining the two Nodes of any Planet is called the Line of the Nodes.

The Names of most of the Constellations were given by the ancient Astronomers who reckoned that Star in *Aries*, now marked ♈ (according to *Bayer*) to be the first Point in the Ecliptic, this for being next the Sun when he entered the vernal Equinox; and at that Time each Constellation was in the Sign by which it was called; but Observations shew, that the Point marked in the Heavens by the vernal Equinox, has been constantly going backwards, by a small Quantity every Year; whereby the Stars appear to have advanced as much forwards, so that the Constellation *Aries* is now almost removed into the Sign *Taurus*; the said first Star in *Aries* being got almost 30 Degrees forward from the Equinox; which Difference is called the *Procession of the Equinox*, whereof the yearly Alteration is about 50 Seconds of a Degree, or about a Degree in 72 Years.

All the Planets have one common Focus, in which the Sun is placed; for as no other Supposition can solve the Appearances that are observed in the Motion of the

Planets, and as it also agrees with the strictest physical and mathematical Reason; therefore it is now received as an elementary Principle.

The Line of the Nodes of every Planet passes through the Sun; for as the Motion of every Planet is in a Plane passing through the Sun, consequently the Intersections of these Planes, that is, in the Lines of the Nodes, must also pass through the Sun.

All the Planets in their Revolutions are sometimes nearer, sometimes farther from the Sun; this is a Consequence of the Sun not being placed in the Centre of each Orbit, the Orbits being Ellipses.

The Aphelion, or superior Apsis, is, that Point of the Orbit which is farthest distant from the Sun: and the Perihelion, or inferior Apsis, is that Point which is nearest the Sun: And the transverse Diameter of the Orbit, or the Line joining the two Apses, is called the Line of the Apses, or Apsides.

The Planets move faster as they approach the Sun, or come nearer to the Perihelion, and slower as they recede from the Sun, or come nearer the Aphelion. This is not only a Consequence from the Nature of the Planets Motions about the Sun, but it is confirmed by all good Observations.

If a right Line be drawn from the Sun, through any Planet, (which Line is called by some the *Vector Radius*) and be supposed to revolve round the Sun with the Planet, then this Line will describe, or pass through every Part of the Plane of the Orbit, so that the Vector Radius may be said to describe the Area of the Orbit.

There are two chief Laws observed in the Solar System, which regulate the Motion of all the Planets; namely,

I. The Planets describe equal Areas in equal Times; that is in equal Portions of Time the Vector Radius describes equal Areas or Portions of the Space contained within the Planet's Orbit.

II. The Squares of the periodical Times of the Planets are as the Cubes of the mean Distances from the Sun: That is, as the Square of the Time which the Planet *A* takes to revolve in its Orbit, is to the Square of the Time taken by any other Planet *B*, to run through its Orbit; so is the Cube of the mean Distance of *A* from the Sun, to the Cube of the mean Distance of *B* from the Sun.

The mean Distance of a Planet from the Sun is its

Distance from him, when the Planet is at either Extremity of the conjugate Diameter, and is equal to Half of the transverse Diameter.

The foregoing are the two famous Laws of *Kepler*, a great Astronomer, who flourished in *Germany* about the Beginning of the 17th Century, and who deduced them from a Multitude of Observations: But the first who demonstrated these Laws, was the incomparable Sir *Isaac Newton.*

By the second Law, the relative Distances of the Planets from the Sun are known; and if the real Distance of any one be known, the absolute Distances of all the others may thereby be obtained.

Besides the Planets already mentioned, there are other great Bodies, that sometimes visit our System, which are a Sort of temporary Planets; for they come and abide with us for a while, and afterwards withdraw from us for a certain Space of Time, after which they again return. These wandering Bodies are called Comets.

The Motion of the Comets in the Heavens, according to the best Observations hitherto made, seem to be regulated by the same immutable Law with the Planets; for their Orbits are elliptical, like those of the Planets, but vastly narrower or more eccentric. Their Orbits have different Inclinations to the Earth's Orbit; some inclining Northwardly, others Southwardly, much more than any of the planetary Orbits do.

Although both the Comets and the Planets move in elliptic Orbits, yet their motions seem to be vastly different, for the Eccentricities of the Planets Orbits are so small, that they differ but little from Circles; but the Eccentricities of the Comets are so very great, that the Motions of some of them seem to be almost in a right Line, tending directly towards the Sun.

Now, since the Orbits of the Comets are so extremely eccentric, their Motions when they are in their Perihelia, or nearest Distance from the Sun, must be much swifter, than when they are in their Aphelia, or farthest Distance from him; which is the Reason why the Comets make so short a Stay in our System, and, when they disappear, are so long in returning.

The Figures of the Comets are observed to be very different; some of them send forth small Beams, like Hair, every Way round them; others are seen with a long fiery Tail, which is always opposite to the Sun. Their Magnitudes are also very different, but in what Proportion they exceed each other, is as yet uncertain. Nor is it probable that their Numbers are yet known, for they have not been observed with due Care, nor their Theories discovered, but of late Years. The Ancients were divided in their Opinions concerning them; some imagined that they were only a Kind of Meteors, kindled in our Atmosphere, and were there again dissipated; others took them to be some ominous Prodigies; but modern Discoveries prove, that they are Worlds, subject to the same Laws of Motion as the Planets are; and they must be very hard and durable Bodies else they could not bear the vast Heat which some of them, when in their Perihelia, receive from the Sun, without being utterly consumed. The great Comet, which appeared in the Year 1680, was within $\frac{1}{6}$ part of the Sun's Diameter from his Surface; and therefore its Heat must be prodigiously intense, beyond Imagination: And when it is at its greatest Distance from the Sun, the Cold must be as rigid.

The fixed Stars are those bright and shining Bodies which, in a clear Night, appear to us every where dispersed through the boundless Regions of Space. They are termed fixed, because they are found to keep the same immutable Distance from each other in all Ages, without having the Motions observed in the Planets. The fixed Stars are all placed at such immense Distances from us, that the best of Telescopes represent them no bigger than Points, without having any apparent Diameter.

It is evident from hence, that all the Stars are luminous Bodies, and shine with their own proper and native Light, else they could not be seen at such a great Distance. For the Satellites of *Jupiter*, *Saturn*, and the *Herschel*, though they appear under considerable Angles through good Telescopes, yet are altogether invisible to the naked Eye.

Although the Distance betwixt us and the Sun is vastly large, when compared to the Diameter of the Earth, yet it is nothing when compared with the prodigious Distance of the fixed Stars; for the whole Diameter of the Earth's annual Orbit appears from the nearest fixed Star no bigger than a Point, and the fixed Stars are at least 100,000 Times farther from us than we are from the Sun; as may be demonstrated from the Observations of those who have endeavoured to find the Parallax of the Earth's annual Orbit, or the Angle under which the Earth's Orbit appears from the fixed Stars.

Hence it follows, that though we approach nearer to a fixed Star at one Time of the Year than we do at the opposite, and that by the whole Length of the Diameter of the Earth's Orbit, or 190 Millions of Miles, yet this Distance, being so small in Comparison with the Distance of the fixed Stars, their Magnitudes or Positions cannot thereby be sensibly altered. Therefore we may always without Error suppose ourselves to be in the same Centre of the Heavens, since we have always the same visible Prospect of the Stars without any Alteration.

If a Spectator were placed as near to any fixed Star as we are to the *Sun*, he would there observe a Body as large as the Sun appears to us; and our Sun would appear to him no bigger than a fixed Star, and undoubtedly he would reckon the Sun as one of them, in numbering the Stars. Wherefore since the Sun differeth in nothing from a fixed Star, the fixed Stars may be reckoned as so many Suns.

It is not reasonable to suppose that all the fixed Stars are placed at the same Distance from us; but it is more probable that they are every where interspersed through the vast indefinite Space of the Universe; and that there may be as great a Distance betwixt any two of them as there is betwixt our Sun and the nearest fixed Star. Hence it follows, why they appear to us of different Magnitudes, not because they really are so, but because they are at different Distances from us; those that are nearest excelling in Brightness and Lustre those that are more remote, which give a fainter Light, and appear smaller to the Eye.

Astronomers distribute the Stars into several Orders or Classes; those that are nearest to us, and appear brightest to the Eye, are called Stars of the first Magnitude; those that are nearest to them in Brightness and Lustre are called Stars of the second Magnitude; those of the third Class are stiled Stars of the third Magnitude; and so on, until we come to the Stars of the sixth Magnitude, which are the smallest that can be discerned by the naked Eye. There are infinite Numbers of smaller Stars, that can be seen through Telescopes; but these are not reduced to any of the six Orders, and are only called Telescopic Stars. It may be here observed, that though Astronomers have reduced all the Stars that are visible to the naked Eye, into some one or other of these Classes; yet we are not to conclude from thence that all the Stars answer exactly to some or other of these Orders; but there may be in Reality as many Orders of the Stars as they are in Number, few of them appearing of the same Bigness and Lustre.

The ancient Astronomers, that they might distinguish the Stars in regard to their Situation and Position to each other, divided the wholly starry Firmament into several Asterisms or Systems of Stars, consisting of those that are near to one another. These Asterisms are called Constellations, and are digested into the forms of some Animals, as Men, Lions, Bears, Serpents, &c. or to the Images of some known Things, as of a Crown, a Harp, a Triangle, &c.

The starry Firmament was divided by the Ancients into 48 Images or Constellations; twelve of these they placed in that Part of the Heavens in which the Planes of the planetary Orbits are, this Part is called the Zodiac, because the Constellations, placed therein, resemble some living Creature. The two Regions of the Heavens on each Side of the Zodiac, are called the North and South Parts of the Heavens.

The Constellations within the Zodiac are, 1. *Aries* ♈, the Ram; 2. *Taurus* ♉, the Bull; 3. *Gemini* ♊, the Twins; 4. *Cancer* ♋, the Crab; 5. *Leo* ♌, the Lion; 6, *Virgo*, ♍, the Virgin; 7. *Libra* ♎, the Balance; 8. *Scorpio* ♏, the Scorpion; 9. *Sagittarius* ♐, the Archer; 10. *Capricornus* ♑, the Goats; 11. *Aquarius* ♒, the Water bearer; and, 12, *Pisces*, ♓, the Fishes.

The Constellations on the North-side of the Zodiac are thirty-six, *viz.* the *Little Bear*, the *Great Bear*, the *Dragon*, *Cepheus*, a King of *Ethiopia*; the *Greyhounds*; *Bootes*, the Keeper of the Bear; *Mons Menelaus*; *Berenice's Hair*; *Charles's Heart*; the *Northern Crown*; *Hercules* with his Club watching the Dragon; *Cerberus*; the *Harp*; the *Swan*; the *Fox*; the *Goose*; the *Lizard*; *Cassiopeia*; *Perseus*; *Andromeda*; the *Great Triangle*; the *Little Triangle*; *Auriga*; *Pegasus*, or the *Flying Horse*; the *Dolphin*; the *Arrow*; the *Eagle*; *Serpentarius*; the *Serpent*; *Sobieski's Shield*; *Camelopardus*; *Antinous*; the *Colt*; the *Lynx*; the *Little Lion*; and *Musca*.

The Constellations noted by the Ancients on the South Side of the Zodiac, were the *Whales*, the *River Eridanus*, the *Hare*, *Orion*, the *Great Dog*, *Little Dog*, the *Ship Argo*, *Hydra*, the *Centaur*, the *Cup*, the *Crow*, the *Wolf*, the *Altar*, the *Southern Crow*, and the *Southern Fish*. To these have been lately added the following, *viz*. The *Phœnix*, the *Crane*, the *Peacock*, *Noah's Dove*, the *Indian*, the *Bird of Paradise*, *Charles's Oak*, the *Southern Triangle*, the *Fly* or *Bee*, the *Swallow*, the *Chamelion*, the *Flying Fish*, *Teucan*, or the *American Goose*, the *Water Serpent*, and the *Seward Fish*.

The Ancients feigned these particular Constellations or Figures in the Heavens, either to commemorate the Deeds of some great Man, or some notable Exploit or Action; or else took them from the Fables of their Religion, &c. And modern Astronomers still retain them, to avoid the Confusion that would arise by making new ones, when they compare the modern Observations with the old ones.

Some of the principal Stars have particular Names given them, as *Syrius*, *Arcturus*, &c. There are also several Stars that are not reduced into Constellations, and these are called unformed Stars.

Besides the Stars visible to the naked Eye, there is a very remarkable Space in the Heavens, called the *Galaxy*, or *Milky Way*. This is a broad Circle of a whitish Hue, like Milk, going quite round the whole Heavens, and consisting of an infinite Number of small Stars, visible through a Telescope, though not discernible by the naked Eye, by Reason of their exceeding Faintness; yet, with their Light they combine to illumine that Part of the Heavens where they are, and to cause that shining Whiteness.

The Places of the fixed Stars, or their relative Situations one from another, have been carefully observed by Astronomers, and digested into Catalogues. The first among the *Greeks*, who reduced the Stars into a Catalogue, was *Hipparchus*, who, from his own Observations, and of those who lived before him, inserted 1022 Stars in his Catalogue about 120 Years before the Christian Æra; this Catalogue has been since enlarged and improved, by several learned Men, to the Number of 3000, of which there are a great many telescopical, and not to be discerned by the naked Eye; and these are all ranked in the Catalogue as Stars of the seventh Magnitude.

It may seem strange to some, that there are no more than this Number of Stars visible to the naked Eye; for sometimes, in a clear Night, they seem to be innumerable. But this is only a Deception of our Sight, arising from their vehement Sparkling, while we look upon them confusedly, without reducing them into any Order; for there can seldom be seen above 1000 Stars in the whole Heavens with the naked Eye, at the same Time; and if we should distinctly view them, we shall not find many but what are inserted upon a good celestial Globe.

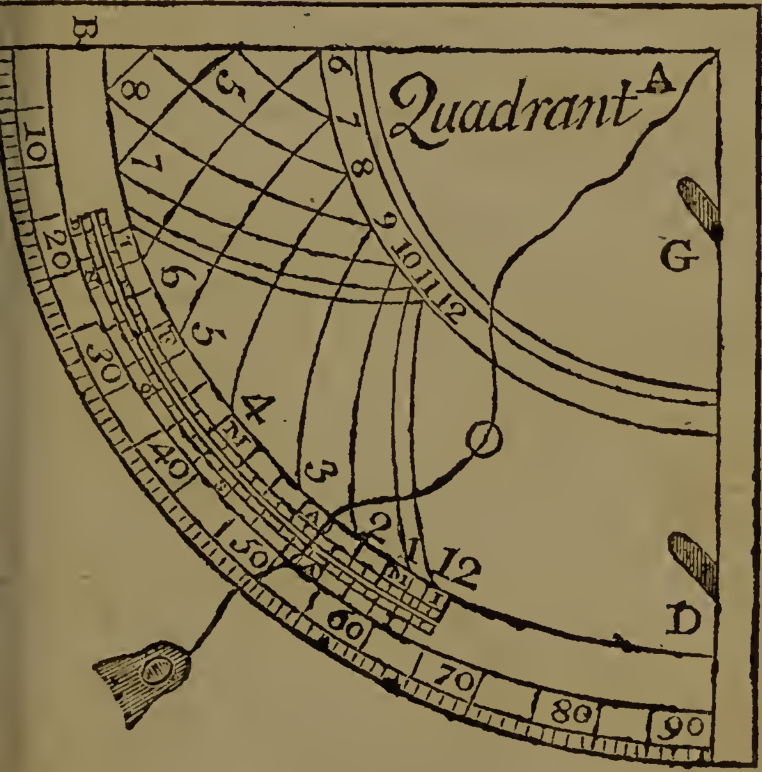
Although the Number of Stars that can be discerned by the naked Eye are so few, yet it is probable there are many more which are beyond the Reach of our Optics; for through Telescopes, they appear in vast Multitudes; every where dispersed, throughout the whole Heavens; and the better our Glasses are, the more of them we will discover. The ingenious Dr. *Hook* has observed 74 Stars in the *Pleiades*, of which the naked Eye is never able to discern above 7; and in the *Orion*, which has but 80 Stars in the *British* Catalogue (and some of them Telescopical) there has been numbered 2000 Stars.

Those who think that all those glorious Bodies were created for no other Purpose than to give us a little dim Light, must entertain a very slight Idea of the Divine Wisdom; for we receive more Light from the Moon itself, than from all the Stars put together.

And since the Planets are subject to the same Laws of Motion with our Earth, and some of them not only equal to, but vastly exceed it in Magnitude, it is not unreasonable to suppose that they are all habitable Worlds. And since the fixed Stars are no ways behind our Sun, either in Bigness or Lustre, is it not probable that each of them have a System of Planetary Worlds turning round them, as we revolve about the Sun? and if we ascend as far as the smallest Star we can see, shall we not then discover innumerably more of these glorious Bodies, which are now altogether invisible to us; and *Ad infinitum*, through the boundless Space of the Universe. What a magnificent Idea must this raise in us of the Divine Being! who is every where, and at all Times present, displaying his Divine Power, Wisdom and Goodness, amongst all his Creatures!

The next Thing I shall proceed to is, to say something in relation to the Art of making Dials: but it may be proper

per to describe and speak of the Use of a very necessary Instrument called a *Quadrant*, the shape of which is here represented.



This Quadrant, or Quarter of a Circle, is useful for various Purposes, *viz.* to take Heights and Distances, whether accessible or inaccessible: To find the Hour of the Day, &c.

Its Description.

The outward Arc is divided into 90 Parts or Degrees (being the fourth Part of the Circle of the Sphere) and figured from 10, 20, &c. to 90; above these Figures are Letters signifying the 12 Calendar Months in the Year; as *J.* for *January*, *F.* for *February*, &c. And again over

those

Letters for the Months are Lines to know the Hour of the Day: and upon the Line *G D*, are Sights of thin Brass to be looked through, or for the Sun to shine through. Lastly, in the Middle or Point of the Quadrant, *viz.* at *A.* is a Line or Thread of Silk, fixed through a Hole, with a Plummet of Lead at the End of it, and also a small Bead in the Middle.

Some of the many Uses of this Instrument are as follow:

Of Heights.

Suppose you would know the Height of a Steeple, Tower, or Tree; hold up the Quadrant, and view through the Sights the Top of the Steeple, Tower, or Tree, and then step forward or backwards, till you find the Plummet hang at Liberty just at 45 Degrees, that is just in the Middle of the Quadrant; then the Height of the Steeple, Tower, or Tree, is equal to the Distance of your standing-place from the Bottom of the Steeple, adding for the Height that you hold the Quadrant from the Ground.

To find the Hour of the Day.

Lay the Thread just upon the Day of the Month, then hold it till you slip the small Bead or Pin's Head to rest on one of the 12 o'clock Lines; then let the Sun shine from the Sight at *G* to the other at *D*, the Plummet hanging at Liberty, the Bead will rest on the Hour-line of the Day.

To find the Latitude of a Place nearly.

Hold up the Quadrant, and through the Sights observe in a clear Star-light Night, the North Pole Star; the Plummet hanging at Liberty, the Thread will rest on the Degrees of Latitude of the Place you are in, or where you take your Observation.

Of Dialling.

DIALLING is a very ancient Art, even as old as th Time of King *Hezekiah*, where Mention is made of the Dia of *Ahaz*, in the 2d Book of *Kings*, Chap. xx. ver. 11.

The Gnomon or Substile of a Post or Horizontal Dia should point directly South, and its Back will be then directly North, the South may be truly known by a goo

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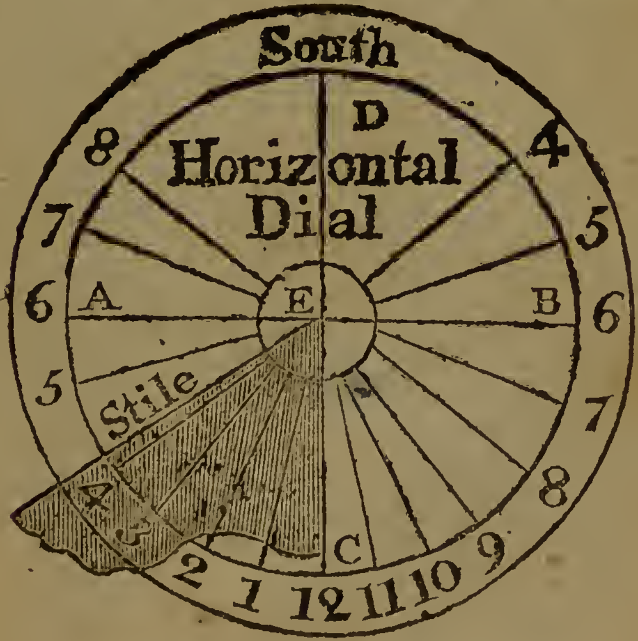
Watch or Clock, just at Noon; for then the Sun is always at the Meridian, and makes just 12 o'Clock; so that knowing the South, it will not be difficult to find the North, it being its Opposite.

To fix a Dial North and South.

Fasten your Board on the Top of a Post, and then with your Compass make 4, or 5, or 6 Circles, one within the other from the Centre or Middle, where place a large Pin perpendicular or upright, and nicely observe, when the Sun shines in the Forenoon, on which Circle the Head of the Pin shadoweth; then there make a Mark; and do the same in the Afternoon, when the Shade of the Pin's-head comes on the same Circle; and from the Midway of the two marks draw a Line to the Centre, on which place your Meridian or 12 o'Clock Line; so will the Post Dial point North and South.

By a Meridian Line you may also know when the Moon, or a Star of Magnitude, comes to the South; which when they do, they are always at the highest, whether by Night or Day.

The following Figure represents a Horizontal-Dial.



First with a Ruler draw the Line *A B*, then cross it in the Centre with another Line, as the Line *C D*, which is the Meridian or 12 o'Clock Line: and the first Line drawn, *viz* *A B*, is the six o'Clock Line: then open your Compasses, and place one Foot at the Beginning of the Degrees, or the Arc Edge of your Quadrant; and extend the other Foot to 60 Degrees, and with that Extent place one Foot in the Centre of the Dial at *E*, where the two first Lines cross one another, and draw the Semicircle *ACB*.

Next, having the 12 o'Clock Line *E C*, to know what Distance must be set off from it, for 1 o'Clock and 11 o'Clock, being all one; be directed by the following small Table, *viz.*

52°		Lat.	
D.	M.	Hour.	
11	55	1	11
24	26	2	10
38	13	3	9
53	44	4	8
71	9	5	7

In the first Column against 1 Hour and 11, you find 11 Degrees and 55 Minutes; which take off the Edge of the Quadrant, by setting one Foot of the Compasses at the Beginning of the Division under *B*, and the other Foot to 11 Degrees 55 Minutes; the Compasses so opened, set one Foot in the Circle at the Bottom of the 12 o'Clock Line, and with the other Foot of the Compasses make a Mark in the Circle both towards *A* and *B*, and from those two Marks draw Lines towards the Centre, which you may aftarwards go over with Ink. Then to make the Hour Lines from 2 and 10 o'Clock, look on the Table for 2 and 10 Hours where you will find 24 Degrees and 26 Minutes, which take off the Degrees of your Quadrant, and mark as the other from the 12 o'Clock Line both Ways in the Circle.

The same is to be done for 3 and 9 o'Clock, and also for 4 and 8 o'Clock; and the like for 5 and 7 o'Clock; and for 5 and 7, 4 and 8, above the 6 o'Clock Line, set off the same Distances as below it.

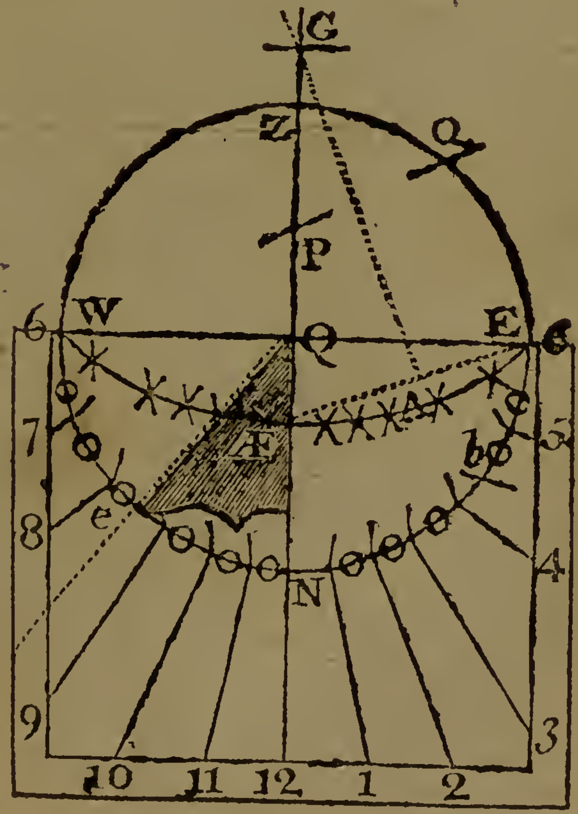
Then for the Height of the Gnomon, or Stile, admit 52 Degrees, take it off the Edge of the Quadrant with the

Compasses as before, and with that Extent set one Foot at Bottom of the 12 o'Clock Line as before, and extend the other Foot in the Circle, and make a Mark, and then draw a Line from thence to *E* the Centre, for the upper Edge of the Stile, and so raise it directly over the Meridian of the 12 o'Clock Line.

Of upright Planes.

Those Planes are said to be erect or upright, which stand perpendicular to the Horizon of the Place, whose upper Part pointeth to the Zenith, and their lower Part to the Nadir; and such are the Walls of Houses, Churches, Steeples, *&c.* against which Dials are commonly made.

How to draw the Hour Lines on a direct South Plane, in the Latitude of 51 Deg. 32 Min. is described by the following Representation.



First, draw the Circle *ZEWN*, representing an upright direct South Plane; next cross it with the Diameters *ZQN* for the Meridian or 12 o'Clock Line; and *WQE* for the Prime Vertical Circle, or Hour-line of Six.

Secondly, out of your Line of Chords take 38 Degrees 28 Minutes (the Complement * of the Latitude of the Place) and set that Distance on the Dial Plane from *Z* to *Q*, and from *E* to *b*, and from *N* to *e*.

Thirdly, lay a Ruler from *W* to Q, and it will cut the Meridian *ZN* in the Point *P*, the Pole of the World; and a Ruler also laid from *W* to *b* will cut the Meridian in *Æ*, which is the Point through which the Equinoctial must pass; for the Drawing of which you have three Points given, *viz.* *E Æ* and *W*, and the Centre will always be in the Meridian Line *ZN*.

Fourthly, divide the Semicircle *ENW* into 12 equal Parts, as the Points *O O O*, *&c.*

Fifthly, lay a Ruler to Q in the Centre, and each of those Points *O O O*, and the Ruler will cross the Equinoctial Circle in the Points * * * *&c.* dividing them into 12 unequal Parts.

Sixthly, lay a Ruler to *P* (the Pole of the World) and every one of the Marks * * * *&c.* and the Ruler will cross the Circle of the Plane in the Points | | | *&c.*

Lastly, if through the Centre *Q* and the respective Points | | | *&c.* you draw right Lines, they will be true Hour-lines on an erect South-plane.

For the Gnomon or Stile, take 38 Deg. 28 Min. out of the Line of Chords, and set them from *N* to *e*, drawing the Line *Qe* for the Axis of the Stile, which must hang directly over the Meridian or Hour-line of 12, and point downwards to the South Pole, because the Plane beholds the South Part of the Meridian.

In making this Dial you make two Dials; for the Erect Direct North Dial is but the Back-side of the South, for as this beholdeth the South Part of the Meridian, so the other faceth the North Part of the Meridian; and as the Meridian Line in the South Dial shews when it is 12 o'Clock at Noon, so the Back-Side thereof, *viz* the North Side, represents the Hour-line of 12 o'clock at Midnight, and therefore not expressed, nor the Hour-lines of 9, 10, 11 at Night, or of 1, 2, or 3 in the Morning, the Sun being never seen by us above the Horizon at those Hours: So that the North Dial is capable of only receiving the Hours of 4, 5, 6, 7 and 8 in the Morning, and 4, 5, 6, 7 and 8 at Night (and in this Latitude) not all of them neither; for it shines not in this Plane, at 8 in the Morning, nor at 4 in the Afternoon; but it is best to put them down as in the Figure following, to know how much it is past in the Morning, and what it wants of 5 in the Afternoon.

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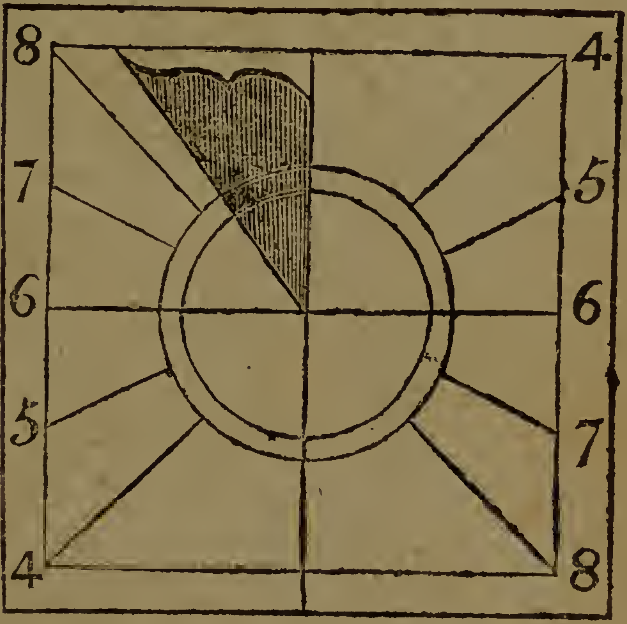
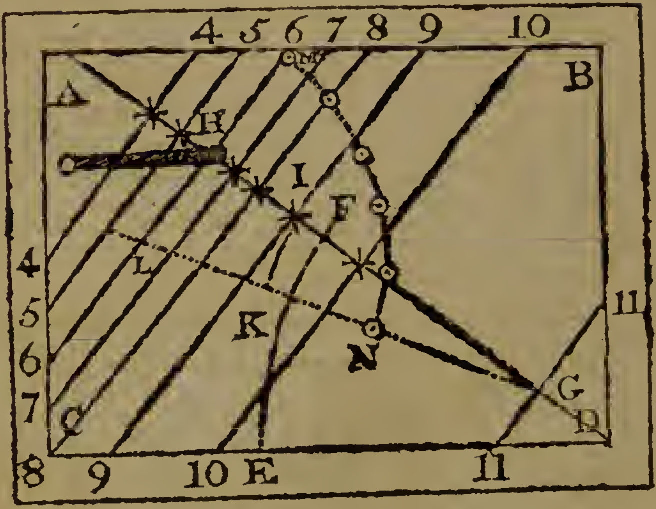
* *The Complement of any Arc is what that Arc wants of* 90°. *Thus the Complement of* 51° 32′ is 38° 28′.

An Erect North Dial.



To draw the Hour-lines on an Erect Direct East or West Plane.——Hour-lines in these Dials must be paralleled to one another, and the Dial not to have any Centre, but drawn as follows.

East Direct Dial in the Latitude of 51 Deg. 32 Min.

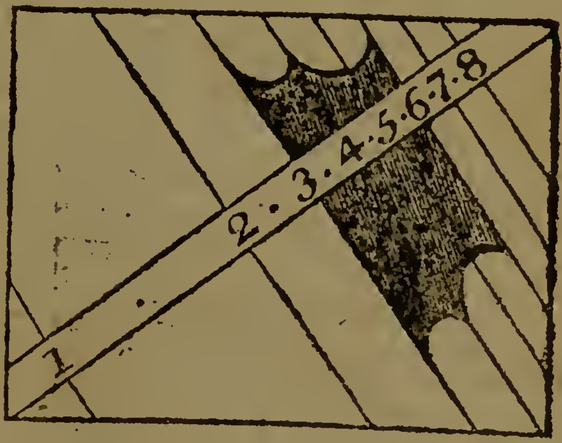


Let *A B C D* be the Dial Plane, on which is to be drawn a Direct East-dial: upon the Point *D*, if an East Dial, and on the Point *C*, if a West, with the Radius (or Chord of 60 Degrees) describe the obscure Arc *E F*; then from your Chords take 38 Deg. 28 Min. the Complement of the Latitude of the Place; and set them from *E* to *F*; and draw the Line *D F* quite through the Plane; then that you may proportion the Stile to the Plane, so that you may bring on all the Hours from Sun-rising to 11 o'Clock, assume two Points in the Line *F D*, one towards the End *D*, (as the Point *G*) for the Hour-line of 11, and another at *H*, for the Hour-line of six; and through the Point *G* and *H*, draw the Lines 11 *G* 11, and 6 *H* 6 on the Point *G*, with the Chord of 60 Degrees, describe the obscure Arc *I K*; and taking 15 Degrees from the Scale of Chords, in the Compasses, set one Foot in *I*, and with the other cut the Arc *I K* and *E*; through *G* and *K* draw the Line *G K L*, cutting the Line 6 *H* 6 in the Point *L*; so shall *L H* be the Height of the perpendicular Stile proportioned to this Plane.

For the drawing of the Hour-lines, set one Foot of the Compasses (opened to 60 Degrees of the Chords) in *L*, and with the other describe the Arc *M N*, between the Hour-line of 6, and the Line *GL*; which divide into five equal Parts in the Points ⊙ ⊙ ⊙ ⊙ ⊙ and a Ruler laid from the Point *L*, to each of these Points ⊙ ⊙ ⊙ &c. will cut the Equinoctial Line *H D* in the Points * * * * *; through which Points draw Lines paralleled to 6 *H* 6, as the Lines 7*7, 8*8, &c. as may be seen in the Figure.

And thus you have made the Dials, *viz.* a West-Dial as well as an East; only the Arc *E F*, through which the Equinoctial passeth in the East-Dial, is drawn on the right Hand of the Plane; but in the West it must be drawn on the Left; and the Hour Lines 4, 5, 6, 7, 8, 9, 10, and 11 in the Forenoon, on the East-Dial must be 8, 7, 6, 5, 4, 3, 2, and 1 in the Afternoon, upon the West-Dial, as in the Figure.

An Erect and Direct West-Dial.



The Stile of the East or West Dials, may be either a traight Pin of the just Length of the Line *H O* in the other igure, which is equal to *H L* fixt in the Point *H*, on the Iour-line of 6, and exactly perpendicular on the Plane, hewing the Hours by the Shadow of the Apex, or very ear the Top thereof; or it may be a Plate of Brass of the ame Breadth with the Distance of the Hour-Lines of 6 nd 3; which Plate must be set perpendicular upon the Iour-line of 6, and so it will shew the Hour by the Shadow f the upper Edge thereof, as in the last Figure.

Of beautifying and colouring Dials.

FIRST, the Boards are to be brushed over with Linseed Oil, thinly ground with the *Spanish* Brown, done over three or four Times (drying between each Time) a little thicker each Time with the Colour; and this is called *Priming*.

To make the fat Oil for Dials.

Boil Red-lead, and Linseed Oil, and a little Litharge of Gold, (about a Penny-worth) together, 'till almost as thick as Syrup; and when cold, and well settled, pour the clearest into a Bottle or Bladder for Use.

The Gold Size for Dials.

Mix fine ground yellow Oaker with the aforesaid fat Oil to such a Consistency, as when used, it may settle smooth e itself.

A Mixture for Hour Lines.

Grind Vermillion or Lamp-black with the fat Oil.

To draw Golden Letters or Figures for the Hours.

First draw them with a Pencil dipt in the Gold Size before mentioned; and when so dry as just to stick to you Fingers, then with a smooth edged Penknife shape you Leaf-gold to your Mind; take it up with a Piece of Cotto Cloth fixed to the End of a Stick, and lay it on the Size pressing it down with the same Cotton, and when dr brush off the loose Gold with a Feather, and smooth th rough Edges of the Letters with a Pencil dipped in red black Colour.

Of the Dial Plane.

Let the Board be of the best seasoned, firmest, cleares Oak, one, two, or more Feet square, and about three Inch thick. Take two Boards and get them planed on bo Sides, and then laid in the Sun-shine, or near a modera Fire two or three Days together, then plane them agai and fix them with good Joints, and fasten them in gluing wi wooden Pegs, as you may have seen Coopers fix their Piec of Heading to their Casks; and when thus glued and drie plane them again, and then fasten them, by nailing tw small Plates of Iron or Tin on the Back. If you cannot g

seasone

seasoned Wood, but green, then boil it about an Hour in Water to make it tough, and keep it from warping. In the general, Wood is accounted better than Stone, because it keeps the Colouring more staunch or firm.

Before you colour your Dial-plate or Board, fix your Iron Stile of 38 Degrees (which indifferently serves for all *England)* and having marked your Hour-lines with Ink and fastened a Nail at the End of each Hour-line, that the Head of each Nail may shadow or direct you to the Centre when it is coloured. And as it may happen that Golden Letters or Figures may decay in a few Years, you may on that Account make them with a White-Lead Paint, painted with Red in a black Margin. When your Dial is finished, and dry, dip a Feather in your Oil, and anoint it thinly; for the finer you mix or grind the Colouring with the Oil, the more beautiful it appears, though not so lasting.

These Hints of colouring Dials, put me in Mind of some other very necessary Touches relating to sundry Mixtures of Colours, and dying of Stuffs, &c. collected from Mr. *Salmon's Polygraphice.*

Of Colours and Dying.

Whites, are Ceruse, Flake-white, and White-lead.

Blacks, are Lampblack, burnt Cherry-stones, and old Ivory burnt.

Reds, are Red-lead, Vermilion, Red-Oaker and Indian Lake.

Greens, are Verdigrease, Verditure, and Sap-green made f the Juice of Buck-thorn Berries.

Yellows, are Saffron, Yellow-pink, Gambogie.

Brown, is Umber burnt.

Gold Colour is Orpiment.

Again *Verdigrease* with a little Sap-green, makes a good nd bright green.

Blues, are Ultramarine, Smalt, Indigo, and blue Bice.

Of mixing Colours.

Colours are mixed by being ground on a Stone with fair Vater severally, and dried and kept in Paper Bags for Use; xcept Lampblack, Saffron, Smalt, Gambogie, and Sap-reen.

Blue, to compound; temper a little Indigo and Smalt with Oil.

A light Blue, mix Smalt and White-lead together.

Lead Colour, mix Lampblack and White-lead together on a Marble.

A Fox Colour, is Umber burnt.

Gold Colour is Orpiment mixt with fat Oil, by a Knife on an Earthen Plate, or Gally-tile rather.

To hinder Colours from cracking, put Oil of Walnuts to them.

Yellow Colour, beat Saffron to Powder, and steep it in Vinegar. Or take the yellow Chives in White Lilies and Gum-water mixt for writing.

Red, Vermilion with Gum Water mixt for writing.

Golden Letters, to write; mix Vermilion and Gum Armoniac with Yolks of Eggs.

Of dying Wool, Stuffs, &c.

To dye *Blue*, take Woad one Pound, and mix it wit four Pints of Boiling Water, and steep Whites in it 24 Hours

To dye red of a clear Colour, take 60 Pints of Wate wherein Bran has been steeped 14 Hours, and when strain' dissolve two Pounds of Allum, and one Pound of Tartar in which Water boil what you have to dye for two Hour then take it out, and boil it in half as much fresh Wate made of Bran; *viz.* 30 Pints; to which add Madder Pounds, and so perfect the Colour with moderate Warmt without boiling.

To dye *Green*, First make a Yellow by the Directi underneath; then take 60 Pints of Water wherein Bra hath been soaked, aforesaid; then strain it; let 3 Poun of Allum be dissolved in it, and then boil what you have dye in it, for two Hours.

To dye *Yellow*, take Woad, two Pounds of the said W ter of Bran, and boil till the Colour is good.

And if you would have the said *Yellow* to be *Green*, p the Stuff into the aforesaid *Blue Dye*.

To dye a *Sand Colour*, add Log-wood to the *Black* before-mentioned.

To dye Linen or Thread, &c. light Red: Take Powder Brazil and Vermilion, of each one Ounce, boiled in Allu water.

To dye Linen or Thread Yellow; dissolve Gambogia in Allum-water, &c.

To stain Skins blue; boil Elder-berries, and with the Liquor brush over the Skins, and wring them; then boil the Berries in Allum-water, and wet them twice over.

Of Money.

The current Coin of this Nation is either made of Copper, Silver or Gold. Of *Copper* is made the Farthings, Half-pence, Pence, and Two-pences. Of *Silver* the Pennies, Two-pences, Three-pences, Groats, Sixpences, Shillings, Half-crowns, and Crowns. But there is very little Silver coined below the Six-pence. Of *Gold* is made the Quarter-Guinea, the third of a Guinea, or Seven Shilling Piece, the Half-Guinea, the Guinea and Five Guinea Piece. There are also some few ancient Pieces of Gold of a pale Colour, as being alloyed with Silver, and therefore may be reckoned the best, and sometimes called Angel or Crown Gold; but the Old Gold, or broad Pieces, are mostly alloyed with Copper, which makes them of a reddish Colour.

Imaginary Money.

We appropriate several Names to money of which there are no Coin; as

	s.	*d.*
The Pound of — — — — —	20	0
The Mark — — — — —	13	4
The Noble, or Half Mark — — —	6	8
The Angel — — — — —	10	0

In *England*, Accounts are kept in Pounds, Shillings, and Pence *Sterling*; and their Marks are derived from their Names in Latin, *viz.* *l.* for *Libræ*, or Pounds, *s.* for *Solidi*, or Shillings, *d.* for *Denarii*, or Pence, *qr.* for *Quadrantes*, or Farthings, four making a Penny; and expressed or set down thus

l.	*s.*	*d.*	*qr.*
4	16	8	2

but better thus, *l.*4—16—8 ½: The Mark for Pounds standing before the Sum denominates the first Number, and the others are known of Course; for after Pounds follow Shillings, and after Shillings succeed Pence, &c. When the Price of any Thing is Shillings and Pence, it is set down thus:

s.	*d.*
4	6

or thus 4/6: and when Shillings and Pence, and Parts of a Penny, expressed thus,

s.	*d.*
4	$6\frac{1}{2}$

or thus 4/$6\frac{1}{2}$. The latter Way by some is accounted the neater, and the best Method to express Parts of a Penny, or Farthings: thus,

$\frac{1}{4}$ a Farthing, or one Fourth Part of what it follows.
$\frac{1}{2}$ a Halfpenny, or one Half of what it follows.
$\frac{3}{4}$ Three Farthings, or 3-4ths or qrs. of what it follows.

And being thus set Fraction-wise, the under Figure shews how many Parts of the Quantity before it is divided into, and the upper Figure shews how many of those under Parts the Fraction stands for; as thus, $\frac{1}{2}$ an Ell, $\frac{3}{4}$ of a Foot, or 9 Inches; and the same of a Shilling is 9 Pence; of a Pound is 15*s*.

If you are to set down 6 Yards and a Half, write thus, Yds. $6\frac{1}{2}$

Nineteen Hundred three Quarters thus, C. $19\frac{3}{4}$

Sixteen Pounds and a Quarter thus, lb. $16\frac{1}{4}$

or else thus, 19 C $\frac{3}{4}$ 16 lb. $\frac{1}{4}$, 5 Foot $\frac{1}{2}$, 14 Days $\frac{3}{4}$. Here the Name is put between the whole Number and the Fraction, which I think is the plainer and better Way: for Example, $6\frac{1}{2}$ Hhds. may, through Ignorance or Wilfulness, be read 6 Half Hhds. as well as 6 Hhds. and Half; and at a certain Place where I have had Business, the Wharfingers Clerks expressed their half Hhds. in this Manner.

Table of the Value of Gold and Silver.*

				l.	*s.*	*d.*
Gold	1 Pound is worth	—	—	48	0	
	1 Ounce —	—	—	4	0	
	1 Pennyweight	—	—	0	4	
	1 Grain —	—	—	0	0	
Silver	1 Pound is worth	—	—	3	0	
	1 Ounce —	—	—	0	5	
	1 Pennyweight	—	—	0	0	
	1 Grain —	—	—	0	0	

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* *The Value of the precious Metals varies continually.*

Notes payable on Demand.

	£.	s.		£.	s.	£.	s.	d.
For	2	0	and not exceeding	5	5	0	0	8
Above	5	5	ditto	30	0	0	1	6
Above	30	0	ditto	50	0	0	2	0
Above	50	0	ditto	100	0	0	3	0
Above	100	0	ditto	200	0	0	4	0
Above	200	0	ditto	500	0	0	5	0
Above	500	0	ditto	1000	0	0	7	6

Bills, or Notes, payable after Date, or Sight.

	£.	s.		£.	s.	£.	s.	d.
For	2	0	and not exceeding	5	5	0	1	0
Above	5	5	ditto	30	0	0	1	6
Above	30	0	ditto	50	0	0	2	0
Above	50	0	ditto	100	0	0	3	0
Above	100	0	ditto	200	0	0	4	0
Above	200	0	ditto	500	0	0	5	0
Above	500	0	ditto	1000	0	0	7	6

Notes payable on Demand, and re-issuable after Payment.

	£.	s.		£.	s.	£.	s.	d.
For	1	1	and not exceeding			0	0	3
Above	1	1	ditto	2	2	0	0	6
Above	2	2	ditto	5	5	0	0	9
Above	5	5	ditto	20	0	0	1	0

Foreign Bills of Exchange.

	£.	s.		£.	s.	£.	s.	d.
Where the Sum shall not exceed				100	0	0	1	0
Above	100	0	ditto	200	0	0	2	0
Above	200	0	ditto	500	0	0	3	0
Above	500	0	ditto	1000	0	0	4	0

RECEIPTS, If in full of all Demands. 0 5 0

	£.	s.		£.	s.	£.	s.	d.
For	2	0	and under	10	0	0	0	2
	10	0	ditto	20	0	0	0	4
	20	0	ditto	50	0	0	0	8
	50	0	ditto	100	0	0	1	0
	100	0	ditto	200	0	0	2	0
	200	0	ditto	500	0	0	3	0
	500	0	or upwards			0	5	0

Bond.

	£.	s.		£.	s.	£.	s.	d.
For any Sum not exceeding				100	0	1	0	0
Above	100	0	and under	300	0	1	10	0
	500	0	ditto	1000	0	3	0	0
	1000	0	ditto	2000	0	4	0	0
	2000	0	ditto	3000	0	5	0	0
	3000	0	ditto	4000	0	6	0	0
	4000	0	ditto	5000	0	7	0	0
	5000	0	ditto	10000	0	9	0	0
	10000	0	ditto	15000	0	12	0	0
	15000	0	ditto	20000	0	15	0	0
	20000	0				20	0	0

Sundries.

Agreements each	16s.	Debentures . each	4s.
Almanacks	1s.	Deeds and Indentures	1l. 10s. &up.
Awards	1l. 10s.	Inventories	5s.
Bills of Lading	3s.	Protests and Notarial Acts	4s.

Such is the Price of Stamps now, May 1805, but the Reader is to be apprized that there is seldom a Year, in these Times of Taxation in which additional Duties are not laid upon almost all the above-mentioned Notes, Bonds, &c.

A TABLE for Buying or Selling any Commodity by the Great Hundred, which is 112 Pounds.

d.	q	l.	s.	d.	d.	q	l.	s.	d.	d.	q.	l.	s.	d.	d.	q.	l.	s.	d.
0.	1	0	2	4		1	2	18	4		1	5	14	4		1	8	10	4
	2	0	4	8		2	3	0	8		2	5	16	8		2	8	12	8
	3	0	7	0		3	3	3	0		3	5	19	0		3	8	15	0
1	0	0	9	4	7	0	3	5	4	13	0	6	1	4	19	0	8	17	4
	1	0	11	8		1	3	7	8		1	6	3	8		1	8	19	8
	2	0	14	0		2	3	10	0		2	6	6	0		2	9	2	0
	3	0	16	4		3	3	12	4		3	6	8	4		3	9	4	4
2	0	0	18	8	8	0	3	14	8	14	0	6	10	8	20	0	9	6	8
	1	1	1	0		1	3	17	0		1	6	13	0		1	9	9	0
	2	1	3	4		2	3	19	4		2	6	15	4		2	9	11	4
	3	1	5	8		3	4	1	8		3	6	17	8		3	9	13	8
3	0	1	8	0	9	0	4	4	0	15	0	7	0	0	21	0	9	16	0
	1	1	10	4		1	4	6	4		1	7	2	4		1	9	18	4
	2	1	12	8		2	4	8	8		2	7	4	8		2	10	0	8
	3	1	15	0		3	4	11	0		3	7	7	0		3	10	3	0
4	0	1	17	4	10	0	4	13	4	16	0	7	9	4	22	0	10	5	4
	1	1	19	8		1	4	15	8		1	7	11	8		1	10	7	8
	2	2	2	0		2	4	18	0		2	7	14	0		2	10	10	0
	3	2	4	4		3	5	0	4		3	7	16	4		3	10	12	4
5	0	2	6	8	11	0	5	2	8	17	0	7	18	8	23	0	10	14	8
	1	2	9	0		1	5	5	0		1	8	1	0		1	10	17	0
	2	2	11	4		2	5	7	4		2	8	3	4		2	10	19	4
	3	2	13	8		3	5	9	8		3	8	5	8		3	11	1	8
6	0	2	16	0	12	0	5	12	0	18	0	8	8	0	24	0	11	4	0

EXAMPLE.

First, at 5*d.* 3*q.* the Pound, what is the Great Hundred? Look in the Table for 5*d.* 3*q.* in the first Column, and against it in the Second, you shall find 2*l* 13*s.* 8*d.* and so much will 112 Pounds cost. Again, if a Hundred Weight cost 4*l.* 8*s.* 8*d.* find 4*l.* 8*s.* 8*d.* and against it, in the Column towards the Left Hand, you will find 9*d.* 2*q.* and so much it is by the Pound.

Note. For every Farthing that one Pound doth cost, reckon Two Shillings and Four Pence, and that is the Price of the Great Hundred.

INTEREST at *Three per Cent.*

Principal.	*for One Day.*				*Thirty Days*				*A Year.*			
	l.	*s.*	*d.*	*f.*	*l.*	*s.*	*d.*	*f.*	*l.*	*s.*	*d.*	*f.*
£1								2			7	
2							1			1	2	1
3							1	3		1	9	2
4							2	1		2	4	3
5							2	3		3		
6							3	2		3	7	
7							4			4	2	1
8							4	2		4	9	2
9							5	1		5	4	3
10							5	3		6		
20				1			11	3		12		
30				2		1	5	3		18		
40				3		1	11	2	1	4		
50				3		2	5	2	1	10		
60			1			2	11	2	1	16		
70			1	1		3	5	1	2	2		
80			1	2		3	11	1	2	8		
90			1	3		4	5	1	2	14		
100			1	3		4	11		3			
200			3	3		9	10	1	6			
300			5	3		14	9	2	9			
400			7	3		19	8	2	12			
500			9	3	1	4	7	3	15			
600			11	3	1	9	7		18			
700		1	1	3	1	14	6		21			
800		1	3	3	1	19	5	1	24			
900		1	5	3	2	4	4	2	27			
1000		1	7	2	2	9	3	3	30			
2000		3	3	1	4	18	7	2	60			
3000		4	11		7	7	11	1	90			
4000		6	6	3	9	17	3		120			
5000		8	2	2	12	6	7		150			
6000		9	10		14	15	10	3	180			
7000		11	5	3	17	5	2	2	210			
8000		13	1	2	19	14	6	1	240			
9000		14	9	2	22	3	10		270			
10000		16	5	1	24	13	1	3	300			

INTEREST at *Four per Cent.*

Principal.	*One Day.*				*Thirty Days.*				*A Year.*			
	l.	*s.*	*d*	*f.*	*l.*	*s.*	*d.*	*f.*	*l.*	*s.*	*d.*	*f.*
£1								3			9	2
2							1	2		1	7	
3							2	1		2	4	3
4							3			3	2	1
5							3	3		4		
6							4	2		4	9	2
7							5	2		5	7	
8							6	1		6	4	3
9							7			7	2	1
10				1			7	3		8		
20				2		1	3	3		16		
30				3		1	11	2	1	4		
40			1			2	7	2	1	12		
50			1	1		3	3	1	2			
60			1	2		3	11	1	2	8		
70			1	3		4	7		2	16		
80			2			5	3		3	4		
90			2	1		5	11		3	12		
100			2	2		6	6	3	4			
200			5	1		13	1	3	8			
300			7	3		19	8	2	12			
400			10	2	1	6	3	2	16			
500		1	1		1	12	10	2	20			
600		1	3	3	1	19	5	1	24			
700		1	6	1	2	6	0	1	28			
800		1	9		2	12	7		32			
900		1	11	2	2	19	2		36			
1000		2	2	1	3	5	9		40			
2000		4	4	2	6	11	6		80			
3000		6	6	3	9	17	3		120			
4000		8	9		13	3			160			
5000		10	11	2	16	8	9		200			
6000		13	1	3	19	14	6		240			
7000		15	4		23	0	3		280			
8000		17	6	1	26	6	0		320			
9000		19	8	2	29	11	9		360			
10000	1	1	11		32	17	6	1	400			

Prin-cipal.	INTEREST at *Five per Cent.*											
	for One Day.				*Thirty Days.*				*A Year.*			
	l.	*s.*	*d.*	*f.*	*l.*	*s.*	*d.*	*f.*	*l.*	*s.*	*d.*	*f.*
£ 1								3		1		
2							1	3		2		
3							2	3		3		
4							3	3		4		
5							4	3		5		
6							5	3		6		
7							6	3		7		
8				1			7	3		8		
9				1			8	3		9		
10				1			9	3		10		
20				2		1	7	2	1			
30				3		2	5	2	1	10		
40			1	1		3	3	1	2			
50			1	2		4	1	1	2	10		
60			1	3		4	11		3			
70			2	1		5	9		3	10		
80			2	2		6	6	3	4			
90			2	3		7	4	3	4	10		
100			3	1		8	2	2	5			
200			6	2		16	5	1	10			
300			9	3	1	4	7	3	15			
400		1	1		1	12	10	2	20			
500		1	4	1	2	1	1		25			
600		1	7	2	2	9	3	3	30			
700		1	11		2	17	6	1	35			
800		2	2	1	3	5	9		40			
900		2	5	2	3	13	11	2	45			
1000		2	8	3	4	2	2	1	50			
2000		5	5	3	8	4	4	2	100			
3000		8	2	2	12	6	6	3	150			
4000		10	11	2	16	8	9		200			
5000		13	8	1	20	10	11	2	250			
6000		16	5		24	13	1	3	300			
7000		19	2		28	15	4		350			
8000	1	1	10	3	32	17	6	1	400			
9000	1	4	7	3	36	19	8	2	450			
10000	1	7	4	3	41	1	11		500			

A Hint of Generals, or Things proper to be known and remembered on particular Occasions.

A Ream of Paper, 20 Quires.

A Quire of Paper, 24 Sheets.

A Ditto for Printers, 25 Sheets.

A Bale of Paper, 10 Reams. A Bundle Ditto. 2 Reams.

A Roll of Parchment, 5 Dozen, or 60 Skins.

A Dicker of Hides, 10 Skins.

Ditto of Gloves, 10 Dozen Pair.

A Last of Hides, 20 Dickers.

A Load of Timber unhewed, 40 Feet.

———————— hewed, 50 Feet.

A Chaldron of Coals, 36 Bushels.

A Hogshead of Wine, 63 Gallons.

Ditto of Beer, 54 Gallons.

A Barrel of Beer, 36 Gallons.

Ditto of Ale, 32 Gallons.

A Gross, 144, or 12 Dozen.

A Weigh of Cheese, 256 Pounds.

Days in the Year, 365; Weeks, 52, and Hours 8766.

Pence in the Pound, 240; Farthings, 960.

An Acre of Land, 160 square Poles or Perches.

A Load or Comb 40 Bushels.

A Market Load 5 Bushels.

A Last of Corn or Rape-seed, 2 Load or 10 Quarters.

Ditto of Pot Ashes, Codfish, White-herrings, Meal, Pitch, and Tar, 12 Barrels.

Ditto of Flax and Feathers, 17 C. of Gunpowder 24 Barrels or 2400lb. of Wool, 4368lb.

A Ton of Wine, 252 Gallons: Oil of Greenland, 252 Gallons; and Sweet Oil of Genoa, 236 Gallons.

A Ton in Weight, 20 C. of Iron, &c. but of Lead there is but 19 C. and a Half called a Fother.

A Todd of Wool, 28 Pounds.

A Pack of Ditto, 364 Pounds.

A Load of Bricks 500; and of plain Tiles 1000.

A Stone of Fish 8lb. and of Wool 14lb. The same for Horseman's Weight, and also Hay; but Pepper, Cinnamon, and Allum, have but 13lb. ½ to the Stone.

Ditto of Glass, 5 Pounds; and a Seam of ditto, 24 Stone.

A Truss of Hay, 56 Pounds, and a Load of ditto, 39 Trusses. But New Hay in June and August, ought to be 60 Pounds to the Truss; as per Statute of 2 William and Mary 1693.

A

A Cade of Red-Herrings, 500; and of Sprats, 1000
Iron and Shot 14lb. to the Stone.

Barrels of Sundry Commodities.

Anchovies, 30 lb.
A double Barrel, 60 lb.
Nutts or Apples, 3 Bushels.
Pot-ash or Barilla, 200 lb.
White or Black Plates, 300
Candles, 10 doz. lb.
Salmon or Eels, 42 Gall.
Figs 3 qrs. 14 lb. to 2 C ¼

Raisins, 1 Cwt.
Oil 31 Gallons and Half.
Spanish Tobacco, 2 C to 3 C.
Gunpowder, 1 Cwt.
Soap, 240 lb.
Butter, 224 lb.
Herrings, 32 Gallons.

Things in Wholesale Trade, bought and sold by the Thousand.

Cuttle Bones
Oranges and Lemons
Chair Nails
Tacks and Tentor Hooks
Pomegranates and Tazels
Goose Quills and Thimbles

Bricks
Clinkers or Flanders Tiles
Billets and Leaves of Horn
Barrel Hoops
Squirrel Skins
Slate and Hilling Stones

Pins and small Needles by the 1000 Dozen.

Things sold and bought at Six Score to the Hundred.

Banks and Barlings
Barrel and Pipe Boards
Bompspars and Bow-staves
Canspars and Caprevans
Herrings and Deal Boards
Nails; Eggs and Cod-fish

Cole, Ling, and Newfoundland-fish, Stock-fish of all Sorts
Ells of Canvas, and most Foreign Linens
and Hogshead Staves.

Of Bonds, Bills, Indentures, Letters of Attorney, Wills, and other useful Writings.

Precedents of these are very necessary, not only for the understanding of them, but to know how to make them properly on Occasion.

A Bond from One to One.

KNOW all Men by these presents, that I *Abraham Darmel*, of the Parish of *St. Sepulchre's*, in the City of *London*, Gentleman, am held and firmly bound to *John*

Melvil, of the said City of *London,* Esq. in the Sum o, Fifty Pounds of good and lawful Money of *Great Britain,* to be paid to the said *John Melvil,* or his certain Attorney his Executors, Administrators or Assigns; for the true Payment whereof, I bind myself, my Heirs, Executors and Administrators, firmly by these Presents sealed in the forty-fifth Year of the Reign of our Sovereign Lord *George* the Third, by the Grace of God, of the United Kingdom of *Great Britain* and *Ireland,* King, Defender of the Faith, and so forth, and in the Year of our Lord, One Thousand, Eight Hundred and Five.

The Condition of this Obligation is such, That if the above bounden *Abraham Darmel,* his Heirs, Executors or Administrators, do well and truly pay, or cause to be paid to the above-named *John Melvil,* his Executors, Administrators, or Assigns, the full Sum of twenty-five Pounds of good and lawful Money of *Great Britain,* on the twentieth Day of *August* next ensuing the Date hereof, with the lawful Interest thereof: then this Obligation to be void, or else to remain, continue, and be in full Force and Virtue.

Sealed and Delivered
(being first duly
stamped) in the
Presence of *Abraham Darmel.* ⊙
George Needy,
Thomas Trusty.

Note, *The Mark* ⊙ *in this and the Form subsequent, represents the Seal, which in this and all those in which it appears, ought to be affixed: the Person who executes any of them (a Will excepted, concerning which Directions will be given in its Place) is in the Presence of the Witnesses to take off the Seal (that is the Instrument with which the Impression was made) and then taking the Paper or Parchment, in his or her Right-hand, is to pronounce these Words,* I deliver this as my Act and Deed for the Purposes within mentioned.

A Bill

A Bill with a Penalty.

KNOW all Men by these Presents, that I *John Jenkins*, of the City of *Chichester*, in the County of *Sussex*. Victualler, do acknowledge myself indebted to *Martin Moneyman*, of *East Grimstead*, in the County aforesaid, Grazier, in the Sum of twenty Pounds of good and lawful Money of *Great Britain*, to be paid unto the said *Martin Moneyman*, his Heirs, Executors, Administrators or Assigns, in or upon the 20th Day of *September* next ensuing the Date hereof, without Fraud or further Delay: for and in Consideration of which Payment well and truly to be made and done, I bind myself, my Heirs, Executors, and Administrators, in the penal Sum of forty Pounds, of the like lawful Money, firmly by these Presents: In witness whereof I have hereunto set my Hand and Seal this twenty-fifth Day of *March*, in the forty-fifth Year of the Reign of our Sovereign Lord King *George* the Third, and in the Year of our Lord God, 1805.

Signed, Sealed and Delivered in the Presence of *John Jenkins.* ⊙.
Titus Testimony,
Andrew Affidavit.

A short Bill, or Note of one's Hand.

KNOW all Men by these Presents, that I *Peter Pennyless*, of the Parish of *St. Saviour's, Southwark*, in the County of *Surry*, Blacksmith, do owe, and own myself to stand indebted to *Robert Rich*, of the Parish of *St. Andrew, Holborn*, in the County of *Middlesex*, Gent. in the just and due Sum of Five Pounds of lawful Money of *Great Britain*, which by these Presents I promise to pay unto him the said *Robert Rich*, at or upon the sixth Day of *October* next ensuing the Date hereof: For the true Performance of which Payment, well and truly to be made, and in witness hereof I have set my Hand to these Presents, the 5th Day of *Jan.* 1805.

Peter Pennyless.

Among Men of Business the following Form is commonly used, and is equally effectual in Law.

I Promise to pay to Mr. *Robert Rich*, or his Order, the Sum of Five Pounds, five Months after Date, for Value received, this fifth Day of *May*, 1805, by

Peter Pennyless.

This Note is transferable to another, if *Robert Rich* writes his Name on the Back of it; but then if *Peter Pennyless* doth not pay it, *Robert Rich* is liable to be called on for the Money.

A penal Bill from Two to One.

KNOW all Men by these Presents, That we *Laurence Luckless* and *Peter Pauper*, both of the Parish of *Saint Dunstan, Stepney*, in the County of *Middlesex*, Weavers, do acknowledge and own ourselves to stand indebted to *Gabriel Greedy*, of the Parish of *St. Olave, Southwark*, in the County of *Surry*, Feltmaker, in the just and due Sum of ten Pounds, of good and lawful Money of *Great Britain*, to be paid unto him, the said *Gabriel Greedy*, his Heirs, Executors, Administrators, or Assigns, at or upon the thirteenth Day of *October* next ensuing the Date hereof, without Fraud or further Delay; for, and in Consideration of which Payment, well and truly to be made, we do bind our Heirs, Executors, and Administrators, in the penal Sum of twenty Pounds of the like lawful Money, firmly by these Presents. In witness whereof, we have hereunto set our Hands and Seals, this sixteenth Day of *May*, in the forty-fifth Year of the Reign of our Sovereign Lord King *George* the Third, &c. and in the Year of our Lord One Thousand Eight Hundred and Five.

Signed, Sealed and Delivered in the Presence of
Wimbledon Witness,
Timothy Testis.

Laur. Luckless. ⊙
Peter Pauper. ⊙

Note, That Bills without Penalty are of no more Force or lasting than Book Debts, as they are not sealed; yet they are esteemed better Security, because the Party's Hand, if he contends, may be proved against him; but oftentimes, on the Adjustment of Accounts, it is usual to have the Party's Hand in the Book, which is as valid as the other; but in my Opinion there ought to be a Witness to either of them.

Note also, All Obligations must be in *English*, and the Words at Length; they may be suited to any Condition by only altering the Name or Names, Place or Places of Abode, Time, or Times, Sum or Sums of Money, *Date, &c.*

Every Bond, Letter of Attorney, Indenture, and other Thing to which a Seal is affixed, Wills excepted, must, to render it effectual, be stamped. (See the Table p. 293.)

Thus you may proceed of yourself, and save the Charge of going too far distant to a Scrivener or an Attorney, here being no other Charge necessary but the stamped Paper, and your own Trouble of writing.

A Letter of Attorney.

KNOW all Men by these Presents, That I *Charles Careful*, of *Lewes*, in the County of *Sussex*, Apothecary (for divers Considerations and good Causes me hereunto moving) have made, ordained, constituted and appointed, and by these Presents do make, ordain, constitute, and appoint, my trusty Friend *William Wagstaff*, of *Pemsey*, in the County aforesaid, Gentleman, my true and lawful Attorney, for me, in my Name, and to my Use, to ask, demand, recover, or receive of or from *A. B.* of *Rye* in the said County, the Sum of Forty Pounds; giving, and by these Presents granting to my said Attorney, sole and full Power and Authority, to take, pursue, and follow such legal Courses, for the Recovery, receiving, and obtaining the same, as I myself might or could do, were I personally present; and upon the Receipt of the same Acquittances, and other sufficient Discharges, for me, and in my Name to make, sign, seal, and deliver; as also, one or more Attorney or Attorneys under him to substitute or appoint, and again at his Pleasure to revoke; and further to do, perform, and execute for me, and in my Name, all and singular Thing, or Things, which are or may be necessary touching and concerning the Premises, as fully, thoroughly, and entirely, as I the said *Charles Careful* in my own Person, ought, or could do, in and about the same; ratifying, allowing, and confirming whatsoever my said Attorney shall lawfully do, or cause to be done, in and about the Execution of the Premises, by Virtue of these Presents. In witness whereof I have hereunto set my Hand and Seal, the sixth Day of May, in the forty-fifth Year of the Reign of our Sovereign Lord *George* the Third, by the Grace of God of the United Kingdom of *Great Britain* and *Ireland*, King, &c. and in the Year of our Lord One Thousand Eight Hundred and Five.

A Letter of Attorney by a Seaman.

KNOW all Men by these Presents, that I *Timothy Tarpaulin* Mariner, now belonging to his Majesty's Ship the *Rye*, for divers good Causes and Considerations me thereunto moving, have and by these Presents do make my trusty Friend *Henry Hearty*, Citizen and Baker of *London*, (or my beloved Wife *Penelope Tarpaulin*) my true and lawful Attorney, for me, and in my Name, and for my Use, to ask, demand, and receive, of and from the Right Honourable the Treasurer, or Paymaster of his Majesty's Navy and the Commissioners of Prize-money, and whom else it may concern, as well as all such Wages and Pay, Bounty-money, Prize-money, and all other Sum or Sums of Money whatsoever, as now are, and which hereafter shall and may be due, or payable unto me; also all such Pensions, Salaries, Smart-money, or all other Money and Things whatsoever, which now are, or at any Time hereafter shall or may be due to me, for my Service, or otherwise, in any one of his Majesty's Ship or Ships, Frigates or Vessels: Giving and hereby granting, unto the said Attorney, full and whole Power, to take, pursue, and follow such legal Ways and Courses, for the Recovery, receiving and obtaining, and discharging upon the said Sum or Sums of Money, or any of them, as I myself might or could do were I personally present; and I do hereby ratify, allow, and confirm, all and whatever my Attorney shall lawfully do or cause to be done, in and about the Execution of the Premises, by Virtue of these Presents. In witness whereof I have hereunto set my Hand and Seal, this twenty-second Day of *March*, One Thousand Eight Hundred and Five, *&c.*

Timothy Tarpaulin. ⊙

A short Will in legal Form.

IN the Name of God, *Amen.* I *William Weakly* of the City of *London*, Haberdasher, being very sick and weak in (or in perfect Health of) Body, but (or and) of perfect Mind and Memory, Thanks be given unto God; calling unto Mind the Mortality of my Body, and knowing

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that it is appointed for all Men once to die, do make and ordain this my last Will and Testament: That is to say principally, and first of all, I give and recommend my Soul into the Hand of Almighty God that gave it, and my Body I recommend to the Earth; to be buried in decent Christian Burial, at the Discretion of my Executors; nothing doubting but at the general Resurrection, I shall receive the same again, by the mighty Power of God. And as touching such worldly Estate wherewith it hath pleased God to bless me in this Life, I give, devise, and dispose of the same in the following Manner and Form:

First, I give and bequeath to *Elizabeth,* my dearly beloved Wife, the Sum of five Hundred Pounds, of lawful Money of *England,* to be raised and levied out of my Estate, together with all my houshold Goods, Debts, and moveable Effects.

Also, I give to my well-beloved Daughter *Elizabeth Weakly,* whom I likewise constitute, make, and ordain the sole Executrix of this my last Will and Testament, all and singular my Lands, Messuages, and Tenements, by her freely to be possessed and enjoyed. And I do hereby utterly dissallow, revoke, and disannul all and every other former Testaments, Wills, Legacies, Bequests, and Executors by me in any Ways before named, willed and bequeathed, ratifying and confirming this, and no other, to be my last Will and Testament. In witness whereof I have hereunto set my Hand and Seal, this 12th Day of *April,* in the Year of our Lord One Thousand Eight Hundred and Five.

Signed, Sealed, Published, Pronounced and Declared by the said William Weakly, *as his last Will and Testament, in the Presence of us, who, in his Presence, and in the Presence of each other, have hereunto subscribed our Names.*

Will. Weakly. ⊙

Henry Hardy,
Samuel Short,
William Wortle.

The Testator, after taking off the Seal, must, in the Presence of the Witnesses, pronounce these Words, *I publish and declare this to be my last Will and Testament.*

Note, If a Will be already made, and the Person hath no Mind to alter it, but to add something more, there may be affixed the following Codicil or Schedule to it, and it will stand good in Law, as Part of the Will.

A Codicil to a Will.

Be it known unto all Men by these Presents, That I *William Weakly*, of the City of *London*, Haberdasher, have made and declared my last Will and Testament in Writing, bearing Date the 12th Day of *April*, One Thousand Eight Hundred and Five. I the said *William Weakly*, by this present *Codicil*, do ratify and confirm my said last Will and Testament; and do further give and bequeath unto my loving Cousin and Godson *William Weakly*, junior, the Sum of fifty Pounds of good and lawful Money of *England*, to be paid unto him the said *William Weakly*, by my Executrix, out of my Estate; And my Will and Meaning is, that this *Codicil* be adjudged to be a Part and Parcel of my last Will and Testament; and that all Things therein mentioned and contained be faithfully and truly performed, and as fully and amply in every Respect, as if the same were so declared and set down in my said last Will and Testament. Witness my Hand this 20th Day of *April*, One Thousand Eight Hundred and Five.

Signed in the Presence *William Weakly.* ⊙
of us,
A. B.
C. D.

A Deed of Gift.

TO all People to whom these Presents shall come, I *George Generous*, do send greeting. Know ye, that I the said *George Generous*, of the Parish of *Pancras*, in the County of *Middlesex*, Brick-maker, for and in Consideration of the Love, Good-will, and Affection, which I have and do bear towards my loving Sister, *Sarah Sorrowful*, of the same Parish, and County, Widow, have given and granted, and by these Presents do freely give and grant unto the said *Sarah Sorrowful*, her Heirs, Executors, or Administrators, all and singular my Goods and Chattels, now being in my present Dwelling-house in the Parish aforesaid, known by the Name of *Fishers Eggery*, of which (before the signing of these Presents) I have delivered her, the said

Sarah Sorrowful, an Inventory signed with my own Hand, and bearing even Date, to have and to hold all the said Goods and Chattels in the said Premises or Dwelling-house, to her the said *Sarah Sorrowful*, her Heirs, Executors, or Administrators, from henceforth, as her and their proper Goods and Chattels absolutely without any Manner of Condition. In witness whereof, I have hereunto set my Hand and Seal, this 10th Day of *April*, One Thousand Eight Hundred and Five.

Signed, Sealed, and Delivered in the Presence of George Generous. ⊙
Daniel Drayton.
Aaron Atkins.

Note, This Precedent may be extended to the giving away of Cattle, Corn, House or Land, if not entailed, *&c.* but the Particulars must be named, *&c.*

An Indenture of Apprenticeship.

THIS Indenture witnesseth, that *Richard Reynolds*, Son of *Robert Reynolds*, late of *Pomsey*, in the County of *Sussex*, hath put himself, and by these Presents doth voluntarily put himself Apprentice to *Charles Carpenter*, Citizen and Linen-draper of *London*, to learn his Art, Trade, or Mystery, and after the Manner of an Apprentice to serve him from the Day of the Date hereof, for and during the full Term of Seven Years next ensuing: During all which Time, he the said Apprentice his said Master shall faithfully serve, his Secrets keep, his lawful Commands every where gladly obey. He shall do no Damage to his said Master, nor see it to be done by others, without letting or giving Notice thereof to his said Master. He shall not waste his said Master's Goods, nor lend them unlawfully to others. He shall not commit Fornication, nor contract Matrimony within the said Term. At Cards, Dice, or any unlawful Game, he shall not play, whereby his said Master may be damaged. With his own Goods, or the Goods of others during the said Term, without Licence of his said Master, he shall neither buy nor sell. He shall not absent himself Day nor Night from his said Master's Service without his Leave. Nor haunt Alehouses, Taverns or Playhouses: but in all Things behave himself as a faithful Apprentice ought to do, during the said Term. And the said Master shall use the utmost of his Endeavours to teach, or cause to be taught and instructed the said Apprentice in the Trade and Mystery he now professeth, occupieth, or followeth: and procure or provide for him the said Apprentice, sufficient Meat, Drink, Apparel, Washing and Lodging, fitting for an Apprentice, during the said Term: And for the true Performance of all and every the said Covenants and Agreements either of the said Parties bind themselves unto the other by these Presents.

In witness whereof they have interchangeably put their Hands and Seals this 16th Day of *April*, in the forty-fifth Year of the Reign of our Sovereign Lord George the Third by the Grace of God, of the United Kingdom of *Great Britain* and *Ireland*, King, &c. and in the Year of our Lord God, One Thousand Eight Hundred and Five.

Note, If an Apprentice be enrolled before a Justice of the Peace or other proper Officer, (the Chamberlain being such in *London*) he cannot sue out his Indenture, but upon Proof of unmerciful Usage, Want of Victuals, or other Necessaries, or his Master's being incapable of teaching him his Trade, or not chusing it so to be done at his proper Charge by others. And the same holds good in relation to a Mistress. But there being no Inrollment, an Indenture may be sued out without shewing Cause, in Cities and Corporations, &c.

A General Release.

KNOW all Men by these Presents, That I *Peter Peaceable*, of *Hastings*, in the County of *Sussex*, Tobacconist, have remised, released, and for ever quit Claim to *William Winter*, of *Rye*, in the County aforesaid, Fish-Chapman, his Heirs, Executors and Administrators, of all and all Manner of Action or Actions, Suits, Bills, Bonds, Writings, Debts, Dues, Duties, Accompts, Sum and Sums of Money, Leases, Mortgages, Judgments by Confession or otherwise obtained, Executions, Extents, Quarrels, Controversies, Trespasses, Damages and Demands whatsoever, which by Law or Equity, or otherwise soever, I the said *Peter Peaceable*, against the said *William Winter* ever had, and which I, my Heirs, Executors, or Administrators, shall or may claim, challenge or demand, for or by Reason, or Means, Colour of any Matter, Cause, or Thing whatsoever, to the Day of the Date of these Presents. In witness whereof I have hereunto set my Hand and Seal, this 15th Day of *April*, &c.

Peter Peaceable. ⊙

The

The Complete GARDENER: *Or, The Practice of Gardening in all its Branches, for the twelve Months in the Year.*

JANUARY.

Pleasure Garden.

FROST is to be expected now, and nothing is so dangerous to tender Flower-roots, and their Shoots for Spring.

Ranunculuses, Anemonies and Tulips will be in Danger; cover the Beds to guard them, lay on Pease-straw, where they are not come up; but where the Shoot appears, place Hoops with Mats and Cloths upon them. This is the common Practice; but in that excellent Work, *The Complete Body of Gardening*, lately published, there is a new Method proposed, and much easier and better. This is to place behind them a Reed-hedge, sloping three Feet forward. A Mat is to be let down from the Top in severe Weather, and taken up in mild. This certainly preserves them, and yet does not draw them weak, or make them tender.

Cover the Beds and Boxes of Seedling Flowers; and take off the Defence when the Weather is milder.

Clean the Auricula Plants, pick off dead Leaves, and scrape away the Surface of the Mould; put fresh Mould in the Place of it, and set the Pots up to the Brim in the Mould of a dry Bed, and place behind them a Reed-hedge.

Cover Carnation Plants from Wet, and defend them from Mice and Sparrows.

Kitchen Garden.

Throw up some new Dung in a Heap to heat, that it may be ready to make Hot-beds both for the early Cucumbers and Melons in this Part of the Ground, and for raising Seeds of Annuals in the Flower-garden.

Dig up the Ground that is to be sown with the Spring-crops, that it may lay and mellow.

Nurse the Cauliflower Plants kept under Glasses carefully; shut out the Frost, but in the Middle of milder Days let in a little Air; pick up the dead Leaves, and gather up the Mould about the Stalks.

Make a slight Hot-bed in the open Ground, for young Sallading, and place Hoops over it, that it may be covered in very hard Weather.

Plant out Endive for Seed into warm Borders; earth and blanch Cellery.

Sow a few Beans and Peas, and seek and destroy Snails and other Vermin.

Orchard and Fruit Garden.

Fruit Trees, whether in Orchards, or Espaliers, or against Walls, demand the same general Management.

Cut out dead Wood and irregular Branches, clean the Stumps and Boughs from Moss with a hollow Iron; and repair Espaliers, fastening the Stakes and Poles with Nails and Wire, and tying the Shoots down with the Twigs of Osier.

Place Stakes by all new-planted Trees; and cut Grafts to be ready, lay them in the Earth under a warm Wall.

FEBRUARY.

Pleasure Garden.

Make Hot-beds for annual flowers with the Dung laid up for that Purpose, and sow them upon a good Thickness of Mould, laid regularly over the Dung.

Transplant perennial Flowers and hardy Shrubs, *Canterbury* Bells, Lilacs, and the like. Break up and new lay the Gravel-walks. Weed, rake, and clean the Borders, and where the Box of the Edging is decayed, make it up with a fresh Plantation.

Sow Auricula and Polyanthus Seeds in Boxes; these should be made of rough Boards six Inches deep, with Holes at the Bottom for the running off of Water; they must be filled with light Mould, and the Seeds scattered thinly over the Surface, then some more Mould must be sifted over them a Quarter of an Inch thick, and they must be set where they may enjoy the Morning Sun.

Plant out Carnations into Pots for flowering.

Kitchen Garden.

Dig and level Beds for sowing Radishes and Onions, Carrots and Parsnips; and *Dutch* Lettuce: Leeks and Spinach, should also be sown now, also Beets, Cellery, Sorrel and Marygolds, with any other of the hardy Kinds.

Make up the Hot-beds for early Cucumbers, and sow Cauliflower-seeds and some others.

Plant Beans and sow Pease; the best Way, in these useful Things, is to sow a new Crop every Fortnight, that if one succeeds and another fails, as will often be the Case, there may still be a constant Supply, at the due Season, for the Table. Plant Kidney-beans upon a Hot-bed for an early Crop. The Dwarf, White, and *Buttersea* Bean, are the best Sorts. They must have Air in the Middle of mild Days when they are up, and once in two Days they must be gently watered.

Transplant Cabbages, plant out *Silesia* and Cos Lettuce from the Beds where they grew in Winter; and plant Potatoes and *Jerusalem* Artichokes.

Orchard and Fruit Garden.

Most Kinds of Trees may now be pruned, though it be better to do it to the Generality in Autumn; whatever has been omitted at that Season, in this Article, must be done now, the hardiest Kinds being pruned first, and such as are more tender at the latter End of the Month, when there will be little Danger of their suffering from the Frosts in the wounded Part.

Transplant Fruit-trees to Places where they are wanted; opening a large Hole, settling the Earth carefully about their Roots, and nailing them at once to the Wall, or fastening them up to strong Stakes. Nail up the tender Trees with Care, and uncover the Fig-trees by Degrees which have been protected from Frost by Mats. Sow the Kernels of Apples and Pears, and the Stones of Plumbs, for Stocks, and keep off Birds that eat the Buds of Fruit-trees.

MARCH.

Pleasure Garden.

Watch the Beds of tender Flowers, and throw Mats over them supported by Hoops in hard Weather.

Continue transplanting all the hardy perennial fibrous-rooted Flowers, Sweet-williams, Golden-rods, and the like.

Dig up the Earth with a Shovel about those which were planted in Autumn, and clean the Ground between them.

All the Pots of flowering Plants must now be dressed. Pick off dead Leaves, remove the Earth at the Top, and put fresh in the Place, then give them a gentle Watering, ane set them in their Places for flowering. In doing this take Care the Roots are not wounded, and repeat the Watering once in three Days.

The third Week in *March* is the Time to sow sweet Pease, Poppies, Catchflies, and all the hardy annual Plants.

The last Week is proper for transplanting Evergreens; and for this Purpose a showery Day should be chosen. New Hot-beds must be made to receive the Seedlings of annual Flowers raised in the former.

Kitchen Garden.

Sow in the Beds of the Kitchen-garden some Carrots and also the large Pease, Rouncevals and Grey.

In better Ground sow Cabbages and Savoys, also Carrots and Parsnips for a second Crop, and towards the End of the Month put in a large Parcel of Beans and Pease.

Sow Parsley and plant Mint.

Sow Cos and Imperial Lettuce; and transplant the finer Kinds.

In the Beginning of the Month sow *Dutch* Parsley for the Roots.

The last Week take the Advantage of Time, or the dry Days, and make Asparagus-beds.

Clear up the Artichoke-roots, slip off the weakest, and plant them out for a new Crop, leaving four from each good Root to bear; and from such as are weaker, two.

Dig up a warm Border, and sow some *French* Beans. Let them have a dry Soil; and give them no Water till they appear.

Orchard and Fruit Garden.

The Grafts which were cut off early and laid in the Ground to be ready for Use, are now to be brought into Service, those of the earliest Kinds are to be used first, and the Apple last of all.

This done, let the Gardener look to the Stocks that were inoculated the last Year, and take off their Heads. A Hand's Breadth should be left on the above Place: This holds the Bud secure by tying to it, and the Sap rises more freely for its Nourishment.

The Fruit-trees that were planted last *October* must be headed; and they should be cut down to almost four Eyes. Some leave only three, but four is much better, the Sap rises more freely.

APRIL.

Pleasure Garden.

Tie up some Stalks of tall Flowers to Sticks, cut these two Feet long, thrust them eight Inches into the Ground, and let them be hid among the Leaves.

Clean and rake the Ground between them.

Take off the Slips of Auriculas, and plant them out carefully for an Increase. Transplant perennial Flowers and Evergreens as in the former Months; and take up the Roots of Colchicams, and other autumnal bulbous Plants.

Sow *French* Honeysuckles, Wall-flowers, and other hardy Plants, upon the natural Ground; and the tenderer Kinds on Hot-Beds. Transplant those sown last Month into the second Hot-bed. Plant some Tuberoses in a moderate Hot-bed, and sow Carnations and Pinks on the natural Ground on open Borders.

Kitchen Garden.

Plant a large Crop of *French* Beans; and chuse for them a dry warm Border. Plant Cuttings of Sage and other aromatic Plants. Sow Marrowfat Pease and plant some Beans for a late Crop.

Sow Thyme, Sweet-marjoram, and Savory.

Prepare Dung for making Ridges to receive the Cucumber or Melon-plants designed for Bell or Hand-glasses.

Sow young Sallading once in ten Days: and sow some Cos and *Silesia* Lettuces.

The Seeds of all Kinds being in the Ground, look to the growing Crops, clear away the Weeds every where among them, and dig up the Earth between the Rows of Beans, Pease, and all other Kinds that are planted at Distances. This gives them a strong Growth, and brings them much sooner to Perfection, then can be done by any other Method.

Draw up the Mould to the Stalks of the Cabbages, and Cauliflower-plants; and in cold Nights cover the Glasses over the early Cucumbers and Melons.

Orchard and Fruit Garden.

Look to the Fruit-trees against the Walls and Espaliers. Take off all foreright Shoots, and train such as rise kindly.

Thin Apricots upon the Trees, for there are usually many more than can ripen; and the sooner this is done, the better the others succeed.

Water new-planted Trees.

Plant Cuttings of Vines, and look over the grown ones. Nip off improper Shoots. When two rise from the same Eye, always take off the weakest.

Weed Strawberry-beds; cut off the Strings; stir the Earth between them; and once in three Days water them.

Dig up the Earth in the Borders near Fruit-trees. Never plant any large Kind of Flowers or Kitchen-things upon them: And it is better if nothing be sown or planted on these Borders; they all starve the Fruit.

MAY.

Pleasure Garden.

Observe, when the Leaves of Sow-breads are decayed, take up the Roots, laying them carefully by till the Time of planting.

Take up the Hyacinth-roots which have done flowering, and lay them sideways in a Bed of dry rich Mould, leaving the Stems and Leaves out to die away; this Practice greatly strengthens the Roots.

Roll the Gravel walks carefully and frequently, and keep the Grass clean mowed.

Clean all the Borders from Weeds; take off all straggling Branches from the large flowering Plants, and train them up in a handsome Shape.

Plant out *French* and *African* Marygolds, with other Autumnals, from the Hot-beds, the last Week of this Month, chusing a cloudy warm Day.

Tie up the Stalks of Carnations. Plant Cuttings of the Lychinis, and Lychinideas, and sow the small Annuals, Candy-tuft, and *Venus* Looking-glass, in the open Ground.

Pot the tender Annuals, as Balsams, Amaranths, and the like, and set them in a Hot-bed Frame till Summer is more advanced for planting them in the open Ground.

Kitchen Garden.

Water, once in two Days, those Plants that require watering.

Destroy the Weeds in all Parts of the Ground, and dig up the Earth between the Rows, and about the Stems of all large Kinds.

Sow small Sallading once in ten Days, as in the former Month: And at the same Time chuse a warm Border, and sow some Purslain: sow also Endive, and plant Beans and Pease for a very large Crop, add *French* Beans to succeed the others. The great Care in these Kinds is to have these several Products fresh and young throughout the Season.

Chuse a moist Day, and an Hour before Sun-set plant out some Savoys, Cabbages, and red Cabbages, draw the Earth carefully up to their Stems, and give them a few careful Waterings.

Orchard and Fruit-Garden.

If any fresh Shoots have sprouted upon the Fruit-trees in Espaliers, or against Walls, nip them off, and train the proper ones to the Wall or Poles, at due Distances, and in a regular Manner.

Look over Vines, and stop every Shoot that has Fruit upon it, to three Eyes beyond the Fruit. Then train the Branches regularly to the Wall, and let such as are designed for next Year's Fruiting, grow some Time longer, their Leaves will give a proper Shade to the Fruit.

Water the new planted Trees, and keep the Borders about the old ones clear; and finally pick off Snails and other Vermin.

JUNE.

Pleasure Garden.

Chuse the Evening of a mild showery Day, and plant out into the open Ground the tender Annuals hitherto kept in Pots in the Hot-bed Frame; they must be carefully loosened from the Sides of the Pot, and shaken out with all the Mould about them: A large Hole must be opened for each; they must be placed upright in it, and when settled in the Ground, by a gentle Watering, must be tied up to Sticks.

Let Pinks, Carnations, and Sweet-williams, be laid this Month for an Increase. Let the Layers be covered lightly and watered every other Day a little at a Time.

The Spring Flowers being now over, and their Leaves faded, the Roots must be taken up and laid by for planting again at a proper Season. Snow-drops, Winter-aconite, and the like are to be thus managed.

The Hyacinth Roots, laid flat in the Ground, must now be taken up, the dead Leaves nipped off, and the Mould; and, when clean, they must be laid upon a Mat in an airy Room to harden, and then laid by.

Tulip Roots must now be taken up also as the Leaves decay; and the like Method must be followed with Anemonies and Ranunculuses.

Cut the Cups or Pods of the Carnations that are near blowing, in three or four Places, that they may blow regularly.

Inoculate some of the fine Kinds of Roses.

Kitchen Garden.

Transplant the Cauliflower Plants sown in *May*. Give them a rich Bed and frequent Waterings.

Plant out Thyme and other savoury Plants sown before, and in the same Manner shade and water them.

Take the Advantage of some cloudy Weather to sow Turnips; and if there be no Showers, water the Ground once in two Days.

Sow Brocoli upon a rich warm Border, and plant out Celery for blanching. This must be planted in Trenches a Foot and a half deep, and the Plants must be set half a Foot asunder in the Rows.

Endive should also be planted out for blanching; but in this the Plants should be set fifteen Inches asunder, and at the same Time some Endive-seed must be sown for a second Crop. Pick up Snails; and in the damp Evenings kill the naked Slugs.

Orchard and Fruit-Garden.

Repeat the taking off of fore right Shoots upon a Wall and Espalier-trees, which we directed last Month. Train proper Branches to their Situation, where they are wanted; once again thin the Wall-fruit; leave Nectarines at four Inches Distance, and the Peaches at five; none nearer; the Fruit will be finer, and the Tree stronger for next Year.

Inoculate the Apricots, and chuse for this Operation a Cloudy Evening. Water new planted Trees, and pick up Snails and Vermin.

JULY.

Pleasure Garden.

Roll the Gravel frequently, and mow the Grass.

Clip Box Edgings; cut and trim Hedges; and look over all the Borders; clearing them from Weeds, and stirring up the Mould between the Plants.

Inoculate Roses and Jessamines of all Kinds that require this Propagation; and any of the other flowering Shrubs.

Take up the Roots of Fritillarias and Maragons, and others of this Sort that are past flowering some Time.

Gather the Seeds of Flowers you design to propagate, and lay them upon a Shelf in an airy Room in the Pods. When they are well hardened, tie them up in Paper-bags, and do not take them out of the Pods till they are to be used.

Lay Pinks and Sweet-williams, as the former, in Earth.

Cut down the Stalks of those Plants which have done flowering, and which you do not keep for Seed; and tie up those now coming into Flower to Sticks, as we directed for the earlier Kinds.

Sow Lupines, Larkspurs, and the like, on dry, warm Borders, to stand the Winter, and flower early next Year.

Kitchen Garden.

Sow a Crop of *French* Beans to come in late, when they will be very acceptable.

Clear all the Ground from Weeds.

Dig between the Rows of Beans and Pease, mow the Ground also about the Artichokes, among the Cabbage Kind.

Water the Crops in dry Weather.

Spinage-seed will be ready for gathering now, as also that of the Welch Onion, and some others; take them carefully off, and dry them in the Shade.

Take up large Onions, and spread them upon Mats to dry for the Winter.

Clear away the Stalks of Beans and Pease that have done bearing.

Watch the Melons as they ripen, and give them very little Water.

Water Cucumbers more freely.

Orchard and Fruit Garden.

Inoculate Peaches and Nectarines.

Take off all Fore-right Shoots in the Espalier and Wall-fruit Trees.

Hang Phials of Honey and Water upon the Fruit-trees, and look carefully for Snails. Keep the Borders where the Fruit-trees stand, clear from Weeds, and stir the Earth about them. This will greatly assist the Fruit in ripening.

Look to the Fruit-trees that have been grafted and budded the last Season. See that there are no Shoots from the Stocks. Whenever they rise, take them off, for they will rob the intended Growth of its Nourishment.

Look carefully to the new-planted Trees; water them often; and whatever Shoots they properly make, fasten to the Wall or Espalier.

Repeat the Care of the Vines, take off improper Shoots, and nail any that are loose to the Wall. Let no Weeds rise in the Ground about them, for they will exhaust the Nourishment, and impoverish the Fruit.

AUGUST.

Pleasure Garden.

See whether the Layers of Sweet-williams, Carnations, and the like, be rooted; transplant such as are, and give frequent gentle Waterings to the others to promote it.

Dig up a mellow Border, and draw Lines at five Inches Distance lengthwise and across; in the Centre of these Squares plant the seedling Polyanthuses, one in each Square.

In the same Manner plant out the seedling Auriculas. Shade them till they have taken Root, and water them once in twenty-four Hours.

Cut down the Stalks of Plants that have done flowering. Save the Seeds you want as they ripen.

Water the tender Annuals every Evening.

Sow Anemonies and Ranunculuses, as also Fritillary, Tulip and Narcissus Seed.

Dig up a Border for early Tulip Roots, and others for Hyacinths, Anemonies, and Ranunculuses. Sow Annuals to stand through the Winter, and shift Auriculas into fresh Pots.

Kitchen Garden.

Sow some Spinage upon a rich Border, and on such another sow Onions. Those two Crops will live through the Winter, unless very severe, and be valuable in the Spring. The second Week in August sow Cabbage-seed of the early Kinds; and a Week after that sow Cauliflower-seed. This will afford the Plants that are to be nursed up under Bed-glasses in the Winter. Some of these may also be ventured in a very well defended Situation open. The last Week of this Month sow another Crop to supply the Place of these in Case of Accidents; for if the Season be very severe, they may be lost; and if very mild, they will run to Seed in Spring. These last Crops must be defended by a Hot-bed Frame, and they will stand out and supply Deficiencies.

Sow Lettuces, the Cabbage and brown Dutch Kinds in a warm and well-sheltered Piece of Ground.

Transplant some of the Lettuces, sown earlier, in warm and well-sheltered Borders.

Take up Garlick, and spread it on a Mat to harden; in the same Manner take up Onions and Rocambole; and, at the latter End of the Month, Shalots.

Orchard and Fruit Garden.

Watch the Fruit on your Wall-trees, and keep off Devourers, of which there are numberless Kinds now swarming about them. Pick up Snails, and hang Bottles of sweet Water for Flies and Wasps.

Fasten loose Branches, and gather the Fruit carefully as it ripens.

Once more go round the Vines, and pull off those trailing Branches so very luxuriantly produced at this Time. See that the Fruit is not shaded by loose Branches, and keep the Borders clear of Weeds. This tends more than is imagined to the well-ripening of the Fruit.

SEPTEMBER.

Pleasure-Garden.

A new Kind of Work begins this Month; which is, preparing for the next Season. Tear up the Annuals that have done flowering, and cut down such Perennials as are past their Beauty, bring in other Perennials from the Nursery Beds, and plant them with Care at regular Distances.

Take up the Box-edgings where they have outgrown their proper Size, and part and plant them afresh.

Plant Tulip and other Flower-roots.

Slip Polyanthuses, and place them in rich shady Borders. Sow the Seeds of Flower-de-luces and Crown Imperial, as also of Auriculas and Polyanthuses according to the Method we delivered before.

Also part off the Roots of Flower-de-lys, Piony, and others of these Kinds. In the last Week transplant hardy flowering Shrubs, and they will be strong next Summer.

Kitchen Garden.

Sow Lettuces of various Kinds, *Silesia*, *Cos*, and *Dutch*, and when they come up shelter them carefully. The common Practice is to shelter them under Hand-glasses; but they will thrive better under a sloping Reed-hedge, such as we described before.

Make up fresh warm Beds with the Dung that has lain a Month in the Heap. Plant the Spawn in these Beds upon Pasture Mould, the same they were found in; and raise the Top of the Bed to a Ridge, to throw off Wet.

Look to the Turnip-beds and thin them, leave the Turnips at six Inches Distance.

Weed the Spinage, Onions, and other new-sown Plants.

Transplant Sage, Lavender, and sweet Plants. Earth up the Celery as it grows up in Height.

Sow young Sallading upon warm and well sheltered Borders.

Clean Asparagus Beds in this Manner:—Cut down the Stalks, and pare the Earth off the Surface of the Alleys, throw this upon the Beds half an Inch thick, and sprinkle over it a little Dung from an old Melon-bed.

Dig up the Ground where Summer Crops have ripened; and lay it in Ridges for the Winter. These should be disposed East and West, and turned once in two Months, they have thus the Advantage of a Fallow.

Plant some Beans and sow some Pease on warm and well-sheltered Borders, to stand out the Winter.

Orchard and Fruit Garden.

The Fruit must now be gathered with Care every Day, and the best Time is an Hour after Sun-rise. Then it should be laid in a cool Place till used. Such as is gathered in the Middle of the Day is always flabby.

Keep Birds from the Grapes, for as they now begin to ripen they will be in continual Danger.

Transplant Goosberries and Currants, and plant Strawberries and Rasberries; they will be rooted before Winter, and flourish the succeeding Season.

OCTOBER.

Pleasure Garden.

Let all the bulbous Roots for Spring flowering be put into the Ground. Narcissus', Maragon, Tulips, and such Ranunculuses and Anemonies as were not planted sooner.

Transplant Columbines, Monks-hood, and all Kinds of fibrous rooted Perennials.

Place the Auriculas and Carnations, that are in Pots, under Shelter.

Some lay the Pots on one Side, but that spoils the Bud for next Year's flowering. The best Way is by Means of a sloping Reed-hedge. Dig up a dry Border, and if not dry enough naturally, dig in some Sand. In this set the Pots up to the Brim. Place the Reed-hedge sloping behind them, and fasten a Mat to its Top that may be let down in bad Weather.

Take off the dead Leaves of the Auriculas before they are thus planted.

Bring into the Garden flowering Shrubs whenever they are wanted, and at the End of the Month prune some of the hardier Kind.

Kitchen Garden.

Plant out the Cauliflower Plants where they are to be sheltered; and it will be proper to plant two for each Glass, where that Method is used, for fear of one failing.

Sow another Crop of Pease, and plant more Beans; chuse for these a dry Spot and well sheltered from the cold Wind of Winter.

Transplant the Lettuces sowed last Month, where they can be defended by a Reed-hedge, or under Walls.

Transplant Cabbage-plants and Coleworts where they are to remain.

Take great Care of the Cauliflower-plants sown early in Summer; they now begin to shew their Heads, so break in the Leaves upon them to keep off the Sun and Rain; it will both harden and whiten them.

Orchard and Fruit Garden.

Prune the Peach and Nectarine Trees and the Vines. This is a very useful Practice, for it strengthens the Buds for Spring.

Cut Grapes for preserving, with a Joint of the Vine to each Bunch.

Gather Fruits for Winter Keeping as they ripen. Transplant all Garden Trees for flowering; prune Currant-bushes, and preserve the Stones of the Fruit for Sowing.

NOVEMBER.

Pleasure Garden.

Throw together a good Heap of pasture Ground, with the Turf among it, to rot for Mould on the Borders.

Transplant Honey-suckles and Spireas, with other hardy flowering Shrubs.

Rake over the Beds of seedling Flowers, and strew some Pea-straw over them to keep out the Frost.

Cut down the Stems of Perennials which have done flowering; pull up Annuals that are spent, and rake and clear the Ground.

Place Hoops over the Beds of Ranunculuses and Anemonies, and lay Mats or Cloths in Readiness to draw over them, in Case of hard Rains or Frost.

Clean up the Borders in all Parts of the Garden, and take Care to destroy not only the Weeds, but all Kinds of Moss.

Look over the Seeds of those Flowers which were gathered in Summer. See they keep dry and sweet, and in a Condition of Growth, and dig a Border or two for the hardier Kinds.

Kitchen Garden.

Weed the Crops of Spinage and such other Kindsas were sown late, for the wild Growth will else smother and starve the Crop.

Dig up a Border under a warm Wall, and sow some Carrots for Spring; sow Radishes in such another Place, and see the Ground be well and deep dug for both. Turn the Mould that was trenched and laid up for fallowing; this destroys Weeds, and prepares the Soil to be enriched by the Air.

Prepare some Hot-beds for Sallading; cover them five Inches with Mould, and sow upon them some Lettuces, and the common small Sallading, Mustard, Rape, Cresses, and Radish.

Plant another Crop of Beans; and sow more Pease for a Succession.

Trench the Ground between the Artichokes, and throw a thick Ridge of Earth over the Roots. This will preserve them from the Frost, and prevent their shooting at an improper Time.

Make a Hot-bed for forced Asparagus.

Take up Carrots and Parsneps, and lay them in Sand to e ready for Use. Give Air at Times to the Plants under Hand-glasses and in Hot-beds, or they will suffer as much y Want of that, as they would have done by the Frost.

Orchard and Fruit Garden.

Stake up all Trees planted for Standards, or the Winds vill rock them at the Bottom, and the Frost will be set in nd destroy them.

Throw a good Quantity of Pease-straw about them, nd lay on it some Brickbats or Pebbles to keep it st; this will mellow the Ground, and keep out the rost.

Continue to prune Wall-fruit Trees, and prune at this ime also the Apple and Pear Kinds. Pull off the late uit of Figs, as it would decay and rot the Branches.

DECEMBER.

Pleasure-Garden.

Draw the Mats and Cloths over the Ranunculus and emony Beds in severe Weather, whether Frost or cold in: but give them Air in the Middle of every tolerable y, and as soon as possible, uncover them all Day; but w on the Mats against Night.

Throw up the Earth where flowering Shrubs are to be nted in Spring; and once in a Fortnight turn it.

Dig up the Borders that are to have Flower-roots plant in them in the Spring, and give them the Advantage Fallow, by throwing up the Ground in a Ridge.

Scatter over it a very little rotten Dung from a Melon Bed, and after this turn it twice during the Winter.

Look over the flowering Shrubs and prune them. Cut away all the dead Wood, shorten luxuriant Branches, and if any cross each other, take away one. Leave them so that the Air can have free Passage between them.

Sift a Quarter of an Inch of good fresh Mould over the Roots of Perennial Flowers whose Stalks have been cut down, and then rake over the Borders. This will give the Whole an Air of Culture and good Management, which is always pleasing.

Kitchen Garden.

Plant Cabbages and Savoys for Seed. This is to be done with great Care; dig up a dry Border, and break the Mould very well; then take up some of the stoutest Cabbage and Savoy Plants; hang them up by the Stalks five Days, and then plant them half Way of the Stalks into the Ground, draw up a good Quantity of the Mould about the Part of the Stalk that is out of the Ground, and make it into a Kind of Hill round each; then leave them to Nature.

Sow another Crop of Pease, and plant another Parcel of Beans to take their Chance for succeeding the others.

Make another Hot-bed for Asparagus, to yield a Supply when the former is exhausted. Continue to earth up Celery, and cover some Endive with a good Quantity of Pease-straw, as it is growing, that you may take up when wanted, which otherwise the Frost will prevent.

Orchard and Fruit Garden.

Prepare for planting Trees where they will be wanted in Spring, by digging the Ground deep, and turning it wel now in the Places where they are to stand.

Scatter over the Borders, where the Fruit-trees are planted, some fresh Mould, and some old Dung, and in a mil Day dig it with a strong three pronged Fork.

Look over the Orchard trees, and cut away superfluo and dead Wood. Let the Branches stand clear of one an ther that the Air may get between, and the Fruit will b better flavoured.

This is the Management of old Trees, and new plante ones are to be preserved by covering the Ground at the Roots.

FINIS.

H. Bryer, Printer, Bridge-street, Blackfriars.

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